



VE7TI

The

# Communicator

JOHN SCHOUTEN • VE7TI • SURREY, BC • CN8907

VE7LCG

Vancouver BC Canada

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July—August 2020



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British Columbia

# SARC



VE7ZD

by British Columbia



  
**SARC**  
Surrey Amateur Radio Club

A Publication Of Surrey Amateur Radio Communications

ITU Region 2 Zone 2 ~ CQ Zone 3



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The **Communicator** is a publication of the Surrey Amateur Radio Communications Society.

It appears bi-monthly, on odd-numbered months, for area Amateur Radio operators and beyond, to enhance the exchange of information and to promote ham radio activity.

During non-publication months we encourage you to visit the Digital Communicator at [ve7sar.blogspot.ca](http://ve7sar.blogspot.ca), which includes recent news, past issues of The Communicator, our history, photos, videos and other information.

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Regular readers who are not SARC members are invited to contribute a \$5 annual [donation](#) towards our Field Day fund via [PayPal](#).

SARC maintains a website at [www.ve7sar.net](http://www.ve7sar.net)

## DEPARTMENTS

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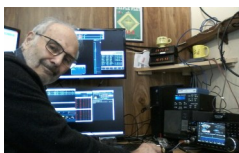
## IN THIS ISSUE

### ***Daniel's Workbench—Has 7 articles this month!***



*Daniel VE7LCG with another set of fabulous projects including making your own custom QSL card*

***Solder Reflow—Kevin VE7ZD***  
*Easier than you think*



***Distributed Multi-Op Contesting***  
*COVID-Aware Team Contesting at a distance with N1MM+ and a VPN*





# QRM

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...from the Editor's Shack

*Do you have a photo or bit of SARC news to share? An Interesting link?*

*Something to sell or something you are looking for?*

*eMail it to [communicator at ve7sar.net](mailto:communicator@ve7sar.net) for inclusion in this publication.*

Hopefully everyone is keeping well these days.

This Communicator is a day or two late as I wanted to include updates from some of the important events that coincided with our June 30<sup>th</sup> deadline...

Two retirements as this SARC year comes to a close. Jason Biggin has resigned from the SARC Board of Directors. We wish Jason well and thank him for his service. Kevin McQuiggin VE7ZD has been nominated and accepted by your Directors to fill Jason's position until the next election at the Annual General Meeting, which we hope will be on September 9<sup>th</sup>, if the health situation permits. We welcome Kevin who is no doubt known to many of you. He has a long history in Amateur Radio and has been a prolific contributor in his time with SARC.

At the June Board meeting Don Hamilton announced his intention to retire as a SARC Director and chair of the Public Service Committee effective June 30. We thank Don for his service and the Board will consider a replacement before the next election.

We are looking at our next Basic course starting on Tuesday, September 22. We

would of course prefer the classroom but COVID may require us to offer it on-line again. The latter has been successfully tested as we had to conclude most of our Spring course in that format and it worked very well. Remember, we offer a student and a family rate.

Your 2020-2021 SARC dues are now payable. The best method currently is to use [PayPal](#) or you can seek out Scott, our Treasurer, and pay him directly.

Saturday morning coffee has resumed at the Kalmar Restaurant, 81<sup>st</sup> and King George Blvd for those ready to break free of COVID isolation. 07:30 - 09:30 weekly.

Other than some contest news, we are short of SARC news in this issue because of COVID and a lack of club events but, in addition to our 'usual' columnists, Daniel VE7LCG has been especially prolific and has contributed several article on a variety of interesting subjects. Thank you Daniel.

Have a great summer!

~ John VE7TI  
Communicator Editor

## ***This Month's Issue...***

*This is an issue with information on QSL Cards and much, much more. Learn how to make them and how the Bureau works. Learn how to make a reflow solder circuit board, and the list goes on!*

*"Each patient carries his own doctor inside him." ~ Norman Cousins*



## **On the Web** [ve7sar.net](http://ve7sar.net)

Between newsletters, watch your e-mail for news, announcements of Amateur Radio events, monthly meetings and training opportunities.

Click the links below to follow our presence on the web and social media:

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**or**  
[tinyurl.com/SARCphoto](http://tinyurl.com/SARCphoto)



## The Rest Of The Story...

### Sir Charles Wheatstone

#### *Measuring Resistance By Using A Bridge*



Charles Wheatstone

*Sir Charles Wheatstone (6 February 1802 - 19 October 1875), was an English scientist and inventor of many scientific breakthroughs of the Victorian era, including the English concertina, the stereoscope (a device for displaying three-dimensional images), and the Playfair cipher (an encryption technique). However, Wheatstone is best known for his contributions in the development of the Wheatstone bridge, originally invented by Samuel Hunter Christie, which is used to measure an unknown electrical resistance, and as a major figure in the development of telegraphy.*

Charles Wheatstone was born in Barnwood, Gloucestershire. His father, W. Wheatstone, was a music-seller in the town, who moved to 128 Pall Mall, London, four years later, becoming a teacher of the flute. Charles, the second son, went to a village school, near Gloucester, and afterwards to several institutions in London. One of them was in Kennington, and kept by a Mrs. Castlemaine, who was astonished at his rapid progress. From another he ran away, but was captured at Windsor, not far from the theatre of his practical telegraph. As a boy he was very shy and sensitive, liking well to retire into an attic, without any other company than his own thoughts.

He often visited an old book-stall in the vicinity of Pall Mall, which

was then a dilapidated and unpaved thoroughfare. Most of his pocket-money was spent in purchasing the books which had taken his fancy, whether fairy tales, history, or science. One day, to the surprise of the bookseller, he coveted a volume on the discoveries of Volta in electricity, but not having the price, he saved his pennies and secured the volume. It was written in French, and so he was obliged to save again, until he could buy a dictionary. Then he began to read the volume, and, with the help of his elder brother, William, to repeat the experiments described in it, with a home-made battery, in the scullery behind his father's house. In constructing the battery, the boy philosophers ran short of money to procure the requisite copper-plates. They had only a few copper coins left. A happy thought occurred to Charles, who was the leading spirit in these researches, 'We must use the pennies themselves,' said he, and the battery was soon complete.

At Christchurch, Marylebone, on 12 February 1847, Wheatstone was married to Emma West. She was the daughter of a Taunton tradesman, and of handsome appearance. She died in 1866, leaving a family of five young children to his care. His domestic life was quiet and uneventful.

Though silent and reserved in public, Wheatstone was a clear and voluble talker in private, if taken on his favourite studies, and his small but active person,



his plain but intelligent countenance, was full of animation. Sir Henry Taylor tells us that he once observed Wheatstone at an evening party in Oxford earnestly holding forth to Lord Palmerston on the capabilities of his telegraph. 'You don't say so!' exclaimed the statesman. 'I must get you to tell that to the Lord Chancellor.' And so saying, he fastened the electrician on Lord Westbury, and effected his escape. A reminiscence of this interview may have prompted Palmerston to remark that a time was coming when a minister might be asked in Parliament if war had broken out in India, and would reply, 'Wait a minute; I'll just telegraph to the Governor-General, and let you know.'

### ***Velocity of electricity***

He achieved renown by a great experiment made in 1834 - the measurement of the velocity of electricity in a wire. He cut the wire at the middle, to form a gap which a spark might leap across, and connected its ends to the poles of a Leyden jar filled with electricity.

Three sparks were thus produced, one at each end of the wire, and another at the middle. He mounted a tiny mirror on the works of a watch, so that it revolved at a high velocity, and observed the reflections of his three sparks in it. The points of the wire were so arranged that if the sparks were instantaneous, their reflections would appear in one straight line; but the middle one was seen to lag behind the others, because it was an instant later. The electricity had taken a certain time to travel from the ends of the wire to the middle. This time was found by measuring the amount of lag, and comparing it with the known velocity of the mirror. Having got the time, he had only to compare that with the length of half the wire, and he could find the velocity of electricity. His results gave a calculated velocity of 288,000 miles per second, i.e. faster than what we now know to be the speed of light (299,792.458 kilometres per second (186,000 mi/s)), but were nonetheless an interesting approximation.

It was already appreciated by some scientists that the "velocity" of electricity was dependent on the properties of the conductor

and its surroundings. Francis Ronalds had observed signal retardation in his buried electric telegraph cable (but not his airborne line) in 1816 and outlined its cause to be induction. Wheatstone witnessed these experiments as a youth, which were apparently a stimulus for his own research in telegraphy. Decades later, after the telegraph had been commercialised, Michael Faraday described how the velocity of an electric field in a submarine wire, coated with insulator and surrounded with water, is only 144,000 miles per second (232,000 km/s), or still less.

Wheatstone's device of the revolving mirror was afterwards employed by Léon Foucault and Hippolyte Fizeau to measure the velocity of light.

### ***Telegraph***

Wheatstone abandoned his idea of transmitting intelligence by the mechanical vibration of rods, and took up the electric telegraph. In 1835 he lectured on the system of Baron Schilling, and declared that the means were already known by which an electric telegraph could be made of great service to the world. He made experiments with a plan of his own, and not only proposed to lay an experimental line across the Thames, but to establish it on the London and Birmingham Railway. Before these plans were carried out, however, he received a visit from Mr William Fothergill Cooke at his house in Conduit Street on 27 February 1837, which had an important influence on his future.

### ***Cooperation with Cooke***

Mr. Cooke was an officer in the Madras army, who, being home on leave, was attending some lectures on anatomy at the University of Heidelberg, where, on 6 March 1836, he witnessed a demonstration with the telegraph of professor Georg Wilhelm Munke, and was so impressed with its importance, that he forsook his medical studies and devoted all his efforts to the work of introducing the telegraph. He returned to London soon after, and was able to exhibit a telegraph with three needles in January 1837. Feeling his want of scientific knowledge, he consulted Michael Faraday and

Peter Mark Roget (then secretary of the Royal Society), the latter of whom sent him to Wheatstone.

At a second interview, Mr. Cooke told Wheatstone of his intention to bring out a working telegraph, and explained his method. Wheatstone, according to his own statement, remarked to Cooke that the method would not act, and produced his own experimental telegraph. Finally, Cooke proposed that they should enter into a partnership, but Wheatstone was at first reluctant to comply. He was a well-known man of science, and had meant to publish his results without seeking to make capital of them. Cooke, on the other hand, declared that his sole object was to make a fortune from the scheme. In May they agreed to join their forces, Wheatstone contributing the scientific, and Cooke the administrative talent. The deed of partnership was dated 19 November 1837. A joint patent was taken out for their inventions, including the five-needle telegraph of Wheatstone, and an alarm worked by a relay, in which the current, by dipping a needle into mercury, completed a local circuit, and released the detent of a clockwork.



Michael Faraday, T. H. Huxley, Wheatstone, David Brewster, and John Tyndall (r.)

The five-needle telegraph, which was mainly, if not entirely, due to Wheatstone, was similar to that of Schilling, and based on the principle enunciated by André-Marie Ampère - that is to say, the current was sent into the line by completing the circuit of the battery with a make and break key, and at the other end it passed through a coil of wire surrounding a magnetic needle free to turn round its centre. According as one pole of the battery or the other was applied to the line by means of the key, the current deflected the needle to one side or the

other. There were five separate circuits actuating five different needles. The latter were pivoted in rows across the middle of a dial shaped like a diamond, and having the letters of the alphabet arranged upon it in such a way that a letter was literally pointed out by the current deflecting two of the needles towards it.

### Early installations

An experimental line, with a sixth return wire, was run between the Euston terminus and Camden Town station of the London and North Western Railway on 25 July 1837. The actual distance was only one and a half-mile (2.4 km), but spare wire had been inserted in the circuit to increase its length. It was late in the evening before the trial took place. Mr Cooke was in charge at Camden Town, while Mr Robert Stephenson and other gentlemen looked on; and Wheatstone sat at his instrument in a dingy little room, lit by a tallow candle, near the booking-office at Euston. Wheatstone sent the first message, to which Cooke replied, and 'never' said Wheatstone, 'did I feel such a tumultuous sensation before, as when, all alone in the still room, I heard the needles click, and as I spelled the words, I felt all the magnitude of the invention pronounced to be practicable beyond cavil or dispute.'

In spite of this trial, however, the directors of the railway treated the 'new-fangled' invention with indifference, and requested its removal. In July 1839, however, it was favoured by the Great Western Railway, and a line erected from the Paddington station terminus to West Drayton railway station, a distance of thirteen miles (21 km). Part of the wire was laid underground at first, but subsequently all of it was raised on posts along the line. Their circuit was eventually extended to Slough in 1841, and was publicly exhibited at Paddington as a marvel of science, which could transmit fifty signals a distance of 280,000 miles per minute (7,500 km/s). The price of admission was a shilling (£0.05), and in 1844 one fascinated observer recorded the following:

*"It is perfect from the terminus of the Great Western as far as Slough - that is, eighteen miles; the wires being in some places underground in tubes, and in others high up in the air, which last, he says, is by far the best*



plan. We asked if the weather did not affect the wires, but he said not; a violent thunderstorm might ring a bell, but no more. We were taken into a small room (we being Mrs Drummond, Miss Philips, Harry Codrington and myself - and afterwards the Milmans and Mr Rich) where were several wooden cases containing different sorts of telegraphs. In one sort every word was spelt, and as each letter was placed in turn in a particular position, the machinery caused the electric fluid to run down the line, where it made the letter show itself at Slough, by what machinery he could not undertake to explain. After each word came a sign from Slough, signifying "I understand", coming certainly in less than one second from the end of the word. Another prints the messages it brings, so that if no-one attended to the bell, the message would not be lost. This is effected by the electrical fluid causing a little hammer to strike the letter which presents itself, the letter which is raised hits some manifold writing paper (a new invention, black paper which, if pressed, leaves an indelible black mark), by which means the impression is left on white paper beneath. This was the most ingenious of all, and apparently Mr. Wheatstone's favourite; he was very good-natured in explaining but understands it so well himself that he cannot feel how little we know about it, and goes too fast for such ignorant folk to follow him in everything. Mrs Drummond told me he is wonderful for the rapidity with which he thinks and his power of invention; he invents so many things that he cannot put half his ideas into execution, but leaves them to be picked up and used by others, who get the credit of them."

### Public attention and success

The public took to the new invention after the capture of the murderer John Tawell, who in 1845, had become the first person to be arrested as the result of telecommunications technology. In the same year, Wheatstone introduced two improved forms of the apparatus, namely, the 'single' and the 'double' needle instruments, in which the signals were made by the successive deflections of the needles. Of these, the single-needle instrument, requiring only one wire, is still in use.

The development of the telegraph may be gathered from two facts. In 1855, the death of

the Emperor Nicholas at St. Petersburg, about one o'clock in the afternoon, was announced in the House of Lords a few hours later. The result of The Oaks of 1890 was received in New York fifteen seconds after the horses passed the winning-post.

### Differences with Cooke

In 1841 a difference arose between Cooke and Wheatstone as to the share of each in the honour of inventing the telegraph. The question was submitted to the arbitration of the famous engineer, Marc Isambard Brunel, on behalf of Cooke, and Professor Daniell, of King's College, the inventor of the Daniell battery, on the part of Wheatstone. They awarded to Cooke the credit of having introduced the telegraph as a useful undertaking which promised to be of national importance, and to Wheatstone that of having by his researches prepared the public to receive it. They concluded with the words: 'It is to the united labours of two gentlemen so well qualified for mutual assistance that we must attribute the rapid progress which this important invention has made during five years since they have been associated.' The decision, however vague, pronounces the needle telegraph a joint production. If it had mainly been invented by Wheatstone, it was chiefly introduced by Cooke. Their respective shares in the undertaking might be compared to that of an author and his publisher, but for the fact that Cooke himself had a share in the actual work of invention.

### Further work on telegraphs

From 1836-7 Wheatstone had thought a good deal about submarine telegraphs, and in 1840 he gave evidence before the Railway Committee of the House of Commons on the feasibility of the proposed line from Dover to Calais. He had even designed the machinery for



making and laying the cable. In the autumn of 1844, with the assistance of Mr. J. D. Llewellyn, he submerged a length of insulated wire in Swansea Bay, and signalled through it from a boat to the Mumbles Lighthouse. Next year he suggested the use of gutta-percha for the coating of the intended wire across the English Channel.

In 1840 Wheatstone had patented an alphabetical telegraph, or, 'Wheatstone A B C instrument,' which moved with a step-by-step motion, and showed the letters of the message upon a dial. The same principle was used in his type-printing telegraph, patented in 1841. This was the first apparatus which printed a telegram in type. It was worked by two circuits, and as the type revolved a hammer, actuated by the current, pressed the required letter on the paper.

The introduction of the telegraph had so far advanced that, on 2 September 1845, the Electric Telegraph Company was registered, and Wheatstone, by his deed of partnership with Cooke, received a sum of £33,000 for the use of their joint inventions.

In 1859 Wheatstone was appointed by the Board of Trade to report on the subject of the Atlantic cables, and in 1864 he was one of the experts who advised the Atlantic Telegraph Company on the construction of the successful lines of 1865 and 1866.

In 1870 the electric telegraph lines of the United Kingdom, worked by different companies, were transferred to the Post Office, and placed under Government control.

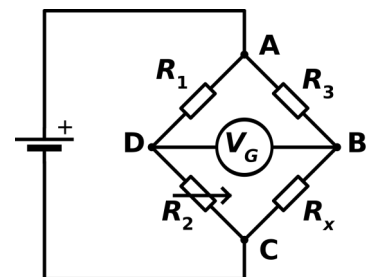
Wheatstone further invented the automatic transmitter, in which the signals of the message are first punched out on a strip of paper, which is then passed through the sending-key, and controls the signal currents. By substituting a mechanism for the hand in sending the message, he was able to telegraph about 100 words a minute, or five times the ordinary rate. In the Postal Telegraph service this apparatus is employed for sending Press telegrams, and it has recently been so much improved, that messages are now sent from London to Bristol at a speed of 600 words a minute, and even of 400 words a minute between London and Aberdeen. On the night of 8 April 1886, when Mr.

Gladstone introduced his Bill for Home Rule in Ireland, no fewer than 1,500,000 words were dispatched from the central station at St. Martin's-le-Grand by 100 Wheatstone transmitters. The plan of sending messages by a running strip of paper which actuates the key was originally patented by Bain in 1846; but Wheatstone, aided by Mr. Augustus Stroh, an accomplished mechanic, and an able experimenter, was the first to bring the idea into successful operation. This system is often referred to as the Wheatstone Perforator and is the forerunner of the stock market Ticker tape

### Wheatstone bridge

The Wheatstone Bridge was originally developed by Charles Wheatstone to measure unknown resistance values and as a means of calibrating measuring instruments, voltmeters, ammeters, etc, by the use of a long resistive slide wire.

In 1843 Wheatstone communicated an important paper to the Royal Society, entitled 'An Account of Several New Processes for Determining the Constants of a Voltaic Circuit.' It contained an exposition of the well known balance for measuring the electrical resistance of a conductor, which still goes by the name of Wheatstone's Bridge or balance, although it was first devised by Samuel Hunter Christie, of the Royal Military Academy, Woolwich, who published it in the Philosophical Transactions for 1833. The method was neglected until Wheatstone brought it into notice. His paper abounds with simple and practical formulae for the calculation of currents and resistances by the law of Ohm. He introduced a unit of resistance, namely, a foot of copper wire weighing one hundred grains (6.5 g), and showed how it might be applied to measure the length of wire by its resistance. He was awarded a medal for his paper by the Society. The same year he invented an apparatus which enabled the reading of a thermometer or a barometer to be registered at a distance by means of an electric contact made by



the mercury. A sound telegraph, in which the signals were given by the strokes of a bell, was also patented by Cooke and Wheatstone in May of that year.

Although today digital multimeters provide the simplest way to measure a resistance. The Wheatstone Bridge can still be used to measure very low values of resistances down in the milli-Ohms range.

The Wheatstone bridge (or resistance bridge) circuit can be used in a number of applications and today, with modern operational amplifiers we can use the Wheatstone Bridge Circuit to interface various transducers and sensors to these amplifier circuits.

The Wheatstone Bridge circuit is nothing more than two simple series-parallel arrangements of resistances connected between a voltage supply terminal and ground producing zero voltage difference between the two parallel branches when balanced. A Wheatstone bridge circuit has two input terminals and two output terminals consisting of four resistors configured in a diamond-like arrangement as shown. This is typical of how the Wheatstone bridge is drawn.

### ***Electrical generators***

In 1840, Wheatstone brought out his magneto-electric machine for generating continuous currents.

On 4 February 1867, he published the principle of reaction in the dynamo-electric machine by a paper to the Royal Society; but Mr. C. W. Siemens had communicated the identical discovery ten days earlier, and both papers were read on the same day.

It afterwards appeared that Werner von Siemens, Samuel Alfred Varley, and Wheatstone had independently arrived at the principle within a few months of each other. Varley patented it on 24 December 1866; Siemens called attention to it on 17 January 1867; and Wheatstone exhibited it in action at the Royal Society on the above date.

### ***Wheatstone in later years***

Wheatstone was knighted in 1868, after his completion of the automatic telegraph. He had previously been made a Chevalier of the Legion of Honour. Some thirty-four distinctions and diplomas of home or foreign societies bore witness to his scientific reputation. Since 1836 he had been a Fellow of the Royal Society, and in 1859 he was elected a foreign member of the Royal Swedish Academy of Sciences, and in 1873 a Foreign Associate of the French Academy of Sciences. The same year he was awarded the Ampere Medal by the French Society for the Encouragement of National Industry. In 1875, he was created an honorary member of the Institution of Civil Engineers. He was a D.C.L. of Oxford and an LL.D. of Cambridge.

While on a visit to Paris during the autumn of 1875, and engaged in perfecting his receiving instrument for submarine cables, he caught a cold, which produced inflammation of the lungs, an illness from which he died in Paris, on 19 October 1875. A memorial service was held in the Anglican Chapel, Paris, and attended by a deputation of the Academy. His remains were taken to his home in Park Crescent, London, (marked by a blue plaque today) and buried in Kensal Green Cemetery.

An that is the rest of his story

~





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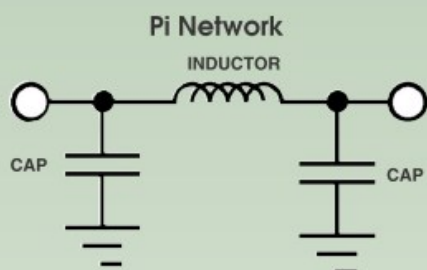
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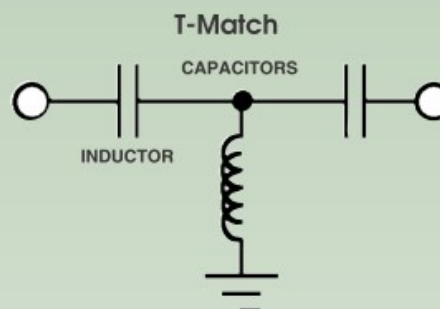
## Mini-Notebook

### Basic Tuners

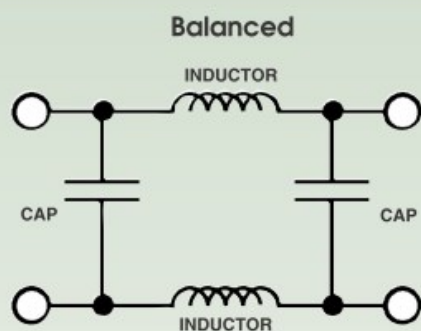
Not sure which tuner design does what? It's confusing for everyone. Check out this handy chart of popular tuner configurations made with variable inductors and capacitors. Each one has its useful place in the ham shack. LDG Tuners are Switched-L Networks for a balance of efficiency, size and tuning range. Visit [www.ldgelectronics.com](http://www.ldgelectronics.com) to learn more and see our full line of Ham Radio accessories.



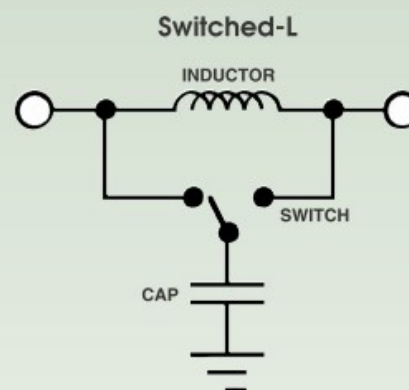
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## Satellite News

### *Video of IARU-R2 'Satellite Communications 101' workshop*

27 May was the "Satellite Communications 101" workshop I presented. Due to technical glitches, this workshop was not available in real time via YouTube, but the video of Wednesday's presentation is now available on YouTube. Watch it here:

<https://youtu.be/f61uwo5Qy6A>

One week earlier, on 20 May, Matias LU9CBL and Guillermo OA4/XQ3SA hosted the Spanish-language version of this workshop, titled "Comunicaciones por Satelite 101". The video of their presentation is available at:

<https://www.youtube.com/watch?v=69D1dJEfGDC>

IARU-R2 plans more workshops covering other topics, in English and Spanish. Information on upcoming workshops is available at:

<https://www.iaru-r2.org/en/news-and-events/workshops/>

Videos of past workshops are available from the IARU-R2 Workshops channel on YouTube:

<https://www.youtube.com/channel/UCnG2SrZ0bsKmTbF2r3YNneQ>

Thanks to IARU-R2 for inviting me to be the presenter for Wednesday's workshop!

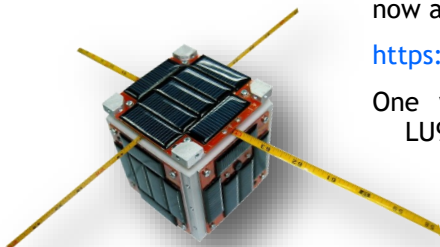
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~ Patrick WD9EWK/VA7EWK

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Did you get your Amateur Radio certificate within the past year or two and want to introduce yourself through TCA to the Amateur Radio community? If so we would love to hear from you.

Drop a line to [tcamag@yahoo.ca](mailto:tcamag@yahoo.ca) and tell us how you were introduced to the magic of Amateur Radio.

Do you credit any particular Amateur ("Elmer") with getting you started? Which aspect of the hobby do you enjoy so far?

Please be sure to include your name, call sign, date and level of certificate – and don't forget to include a photo or two. We hope to hear from you soon!



## Page 13—News You Can Lose

The Lighter Side of Amateur Radio

### The COVID Blues!

By WBØRUR, on the scene

**VILLAGE HIGHLANDS, VT** — In the wake of the Federal Communications Commission's actions to invoke the "Red Light Rule" and cancel the license and application for renewal of K1MAN, a rural West Cheshire County man has been tapped to take his place on the HF airwaves.

Richmond Smithpeters, amateur radio operator K1BOY, says he will take a few days off of work to get ready for the new gig.

"Right now, I'm developing a list of topics which will provide a good platform to launch my three-hour diatribes," says the mild-mannered elementary school teacher.

Combing his thinning dark brown hair and adjusting his horn-rimmed glasses, the teacher - who professes that besides ham radio "... cheese-making is another of my favorite pastimes" - says he'll very likely start with random QRming on 14.313 MHz.

"It seems to be the logical first step. There's so much clatter on that frequency. I'll be able to 'dip a toe' in the water and if I don't get it right the first time, surely no one will notice and I won't be embarrassed," he shrugs.

In the coming weeks, he says he'll progress into controversial broadcasts about patriotism, immigration, one-world conspiracies and the



difference between Roquefort and bleu cheeses.

If you have a topic suggestion for an upcoming K1BOY broadcast, simply send an email to his QRZ address.

~ HamHijinks.com

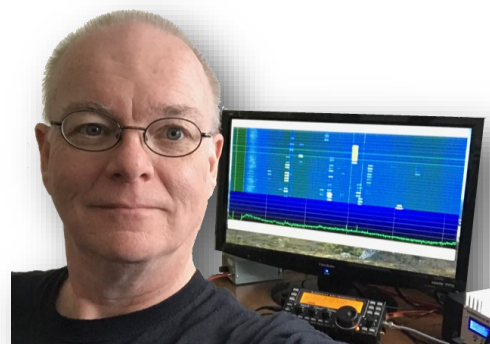


Courtesy ARRL  
—Reprinted with permission

## Radio Ramblings

Kevin McQuiggin VE7ZD/KN7Q

# Solder Reflow



This month I'd like to talk about the use of solder reflow technology for making printed circuit boards (PCBs) and assembling them at home. Solder reflow used to be a complicated and expensive technology that was limited to use in industrial circuit board fabrication shops. Like many other technologies, however, the solder reflow process has evolved in recent years to make use of the technology at home both practical and affordable.

The advent of high-quality open source tools for designing printed circuit boards and solder masks, and the production of several models of small reflow ovens at affordable prices have made the technology accessible for amateur radio and electronic hobbyists.

Reflowed boards are much easier and faster to assemble than traditional "through-hole" circuit boards. Reflowed PCBs have lower cost, higher reliability, and are more consistent in quality. I'm a convert to the reflow process and have made (literally) hundreds of PCBs in my own small reflow oven. For any new design, I would choose a surface mount PCB rather than a through-hole one, except in unusual circumstances.

In this column I'll describe my experience with the technology, how the solder reflow process works, give an overview of the tools needed, and discuss available resources and educational/background material. You'll have enough information to successfully "try this at home"!

### Overview of the Solder Reflow Process

Hams like us want to keep abreast of modern manufacturing techniques, so it is good to know a bit about how surface mount works and how the boards are designed and assembled.

Traditional through-hole printed circuit boards use "leaded" circuit components (i.e. components with long metal leads or pins) such as resistors, capacitors, inductors, transistors, and ICs. These are the traditional electronic components we are all familiar with. See Figures 1 and 3. The leads on each component are fed through a plated hole in the circuit board, and the component is soldered down on the underside of the board.

Through-hole PCBs were first developed in the 1930s and found early application in radio systems and military equipment where ruggedness was a requirement. Through-hole PCB technology was released to the public domain in 1948 [1].

The surface mount process places components on pads on a "planar" circuit board and fixes them in place with solder. The technology was originally called "planar mounting" and originated with IBM in the early 1960s. It was first used in the early computer industry [2].

Through-hole soldering works well, but many new circuit components are unavailable (or at least hard to find) in "leaded" versions because the electronics industry has moved to almost exclusive use of surface mount components.

Surface mount components lack leads and instead have metal pads on their edges or undersides through which the component can be attached to the surface of the underlying printed circuit board. The components sit on the surface of the PCB and are held fast by solder. In lay terms, the solder “glues the component down” and its pads provide the necessary electrical connections for the component. Hence the term “surface mount soldering”.

See Figures 1 and 2 for examples of typical through-hole and surface mount printed circuit boards (PCBs). I produced both of these boards for recent home projects. Figures 3 and 4 illustrate some typical through-hole and surface mount components. Note in Figure 4 that the surface mount parts have no leads but rather pads for attachment to the PCB.

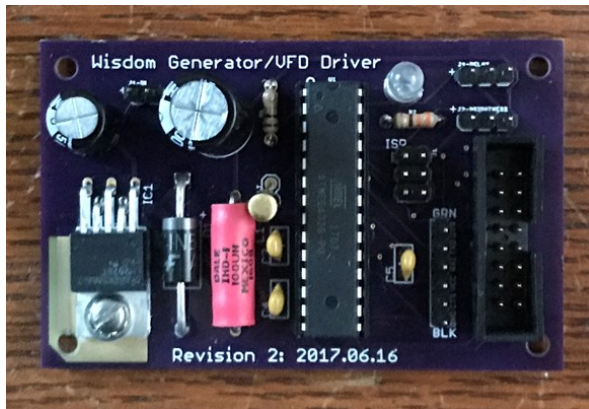


Figure 1 – Typical Through-Hole PCB

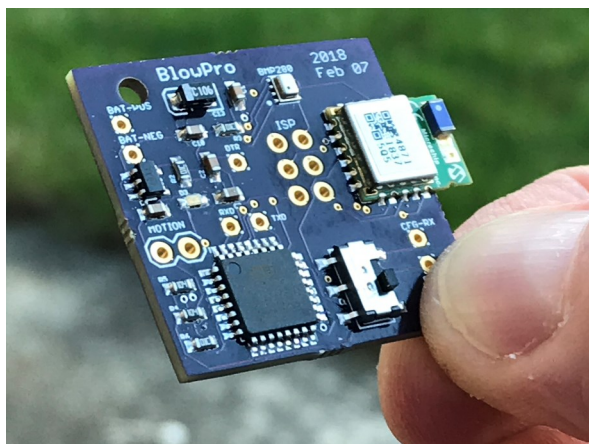


Figure 2 – Typical Surface Mount PCB

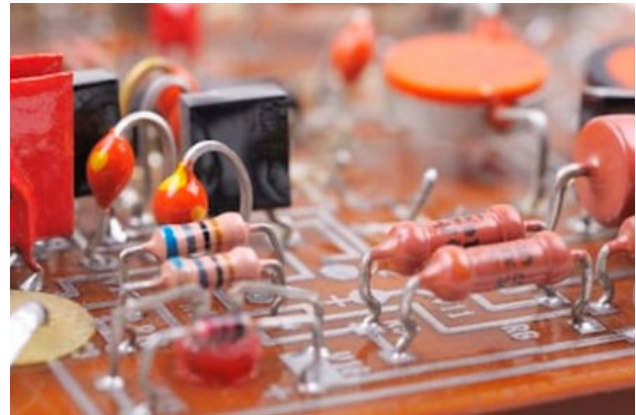


Figure 3 – Typical Through-Hole Components

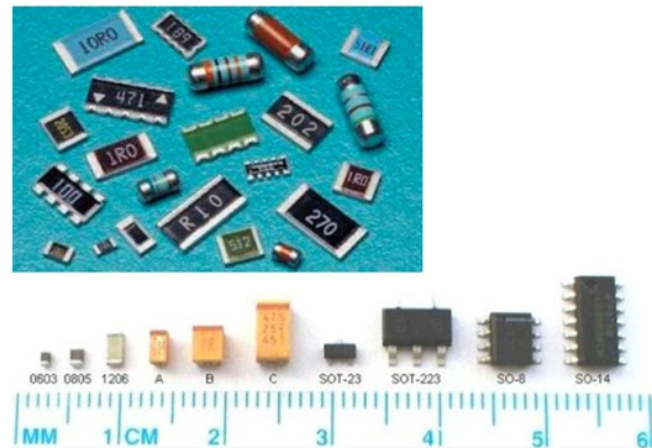


Figure 4 – Typical Surface Mount Components and Sizes [3]

Here's a step-by-step rundown of the solder reflow process:

1. Design your circuit using a free PCB design tool (Figure 5 and details below).
2. Use your PCB design tool to generate a surface mount board layout from your circuit. See Figure 6.
3. Check and double-check your design. As the old carpentry adage goes, “measure twice, cut once”.
4. Generate PCB data files using the design tool and send them via email to a PCB fabrication shop. Send the data files to a stencil cutting shop as well so that they can make you a stencil.



5. Wait for your boards and stencil to arrive by mail.
6. Use the stencil (Figure 9) to “silkscreen” solder paste onto the bare circuit board. See Figure 10.
7. Place the surface mount components by hand onto their pads on the pasted PCB board.
8. Check and double-check your masking and parts placement. Make sure every component is in the right spot, and oriented properly.
9. Put the populated PCB board into your “reflow oven” (see below) and start the reflow cycle. The cycle takes about 7 minutes.
10. Once the oven completes its cooling cycle, remove your brand-new PCB.

When you are designing your own circuit boards checking your work is critical before sending the design out to a fabrication shop. Steps 3 and 8 are very important: I have made my share of errors and omissions with PCB design. It is very disappointing to receive your new PCBs only to discover that you forgot a component or placed it onto the PCB incorrectly!

We will discuss these steps in some detail below.

### ***Component Sizes – Good and Bad***

You can buy surface mount components from any of the usual parts suppliers [4]. They are incredibly cheap (for example, a 10K resistor is \$0.003, or 1/3 of a cent). I usually buy more parts than I need so that I have spares. When you’re trying to place a resistor that is less than a square millimeter in area, for example, it can easily “pop” from your tweezers and will likely never be found. I buy extras, especially of smaller cheap parts, for this eventuality

Note the smaller size of the surface mount components compared to

their leaded equivalents. Figure 5 shows the size of a typical surface mount resistor.

The smaller size of the surface mount parts (which can range from a few millimetres on a side down to a few hundredths of a millimetre) means that the parts are much cheaper to manufacture, but for hobbyists like us the smallest parts are too small to be able to be easily soldered by hand.

It is important for the hobbyist to choose larger surface mount parts which can be easily placed on the PCB by hand using tweezers.

Surface mount parts come in standardized sizes. These sizes are written as XXYY, with XX and YY in hundreds of an inch, for example size “0603” is a part 0.06 x 0.03 inches, or about 1.5 x 0.8 mm. Figure 4 shows some part size designators.

You can purchase, for example, a 100K resistor in sizes ranging from “01005” (0.4 x 0.2 millimeters), through “2920” (7.4 x 5.1 mm) [5]. The smallest parts are about the size of a grain of sand and are only usable in automated circuit board assembly lines.

The best part sizes for hobbyist use are “0603” or “1206”. These parts are placeable by tweezers with the aid of a magnifying glass to check proper placement. When you order your parts, be sure to specify size 1206 or 0603. If you are just starting out, 1206 is a better choice.

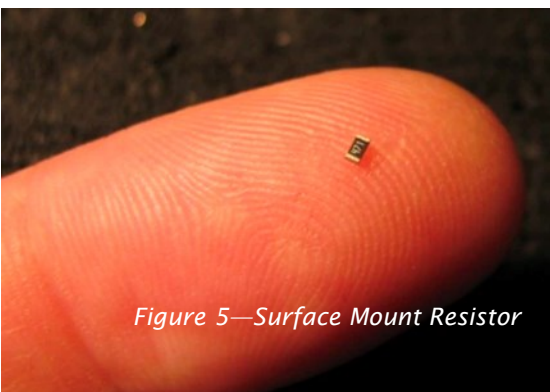
Suitable electronic part tweezers for parts placement on the PCB are available from popular electronic hobbyist shops, for example [6].

Surface mount PCBs can be much smaller than through-hole PCBs for a given circuit design, and the nature of surface mount PCBs means that the circuits lend themselves to automated production processes.

### ***PCB Design***

How can we, as hobbyists, get some experience with surface mount techniques and use the technology in our experiments?

The first thing we need to get started is some good circuit design and board layout software. You may have a circuit that you have designed yourself, or you may be starting with a circuit



*Figure 5—Surface Mount Resistor*

that is published in an amateur radio publication like The Communicator, QST, or QEX. You need to “enter” the circuit into the application, and then use it to generate a PCB layout.

Fortunately, there are several really good open source (i.e. free) PCB design tools available out there. AutoDesk “Eagle” is a very popular application for Windows, MacOS and Linux users. See [7]. I have used it for years and love the program - it will do everything you need to go from a circuit to a PCB (ether through-hole or surface mount). The PCB layout for a circuit can be generated within the program, and the resultant data files sent out for manufacturing, as will be described below.

For UNIX or Linux users, there is another great program called “KiCAD” that does the same things as Eagle. See [8]. My engineer friend AC7FT prefers KiCAD, but I am an Eagle devotee. We have good debates about this over a cold beverage from time to time!

See Figures 6 and 7 for an example of a schematic entered into Eagle, and the PCB board design generated for the circuit, also Eagle-generated. An excellent book on getting started with Eagle is available on Amazon [11].

Using Eagle is beyond the scope of this article, but I may discuss the program in a future column. If there is sufficient interest within SARC, I could also offer a course on Eagle and how to use it for simple circuit/PCB design. Please let the Editor know if you’d be interested in this.

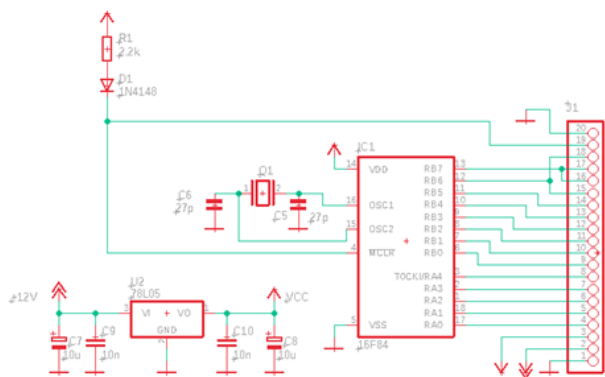


Figure 6 - Eagle Schematic

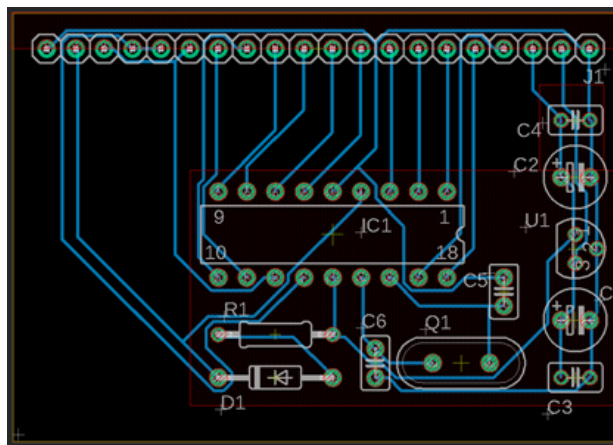


Figure 7 - Eagle Generated PCB Layout (From Schematic in Figure 6)

### PCB Fabrication Shops, and Stencils

There are several great PCB fabrication shops online that serve hobbyists like us. They also serve many engineers, and even the research labs of major electronic manufacturers. These shops accept the PCB design files generated by programs like Eagle and KiCAD and turn them into “real” circuit boards.

The quality is amazing. Turnaround is fast, and it is possible to get boards to your door in a few days if you are willing to pay a bit more than the standard shipping rate. The standard rate gets you your boards in about ten to fourteen days.

PCB costs are incredibly low. Most shops will make you three boards for US\$10, or you can pay just US\$1 per square inch of PCB, if that cost works out better for your project. I was able to get the parts for one of my latest projects into just one square inch, so my PCB costs for the project were next to nothing! I spent more on connectors and a case for the little device. See Figure 8 for my circuit board.

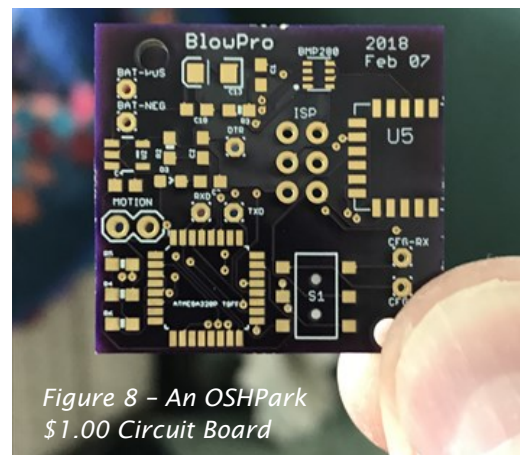


Figure 8 - An OSHPark \$1.00 Circuit Board

I would highly recommend “OSHPark” [9], a popular fabrication shop in Oregon, as an excellent, high-quality board production service for new users. “OSH” stands for “Open Source Hardware”, and the company is actually a society that serves both hobbyists and industry.

I also recommend another company in Utah called “OSHStencils” [10] as a source of the solder masks that you will use to apply solder paste (see below) to all the pads on your PCB before you place the components onto it. The

stencil is the same size as your circuit board and has little holes in it that correspond to the solder pads on the PCB which will hold your components. See Figure 9.

You line up the holes in the stencil with the solder pads on the PCB (see Figure 10) and apply the paste to the top of the stencil. Then when you remove

the stencil, the PCB has solder paste in all the right places. Think of those T-shirts we all silk-screened in your youth!

For stencil material, you have a choice of mylar or steel. I have used both types of stencils: the mylar ones are cheaper but they wear out faster. The steel ones are very durable. I always order steel stencils these days, as they are only a bit more expensive than the mylar ones and last longer.

Prices for stencils are comparable to the prices for PCBs. The last small steel

stencil I ordered for a project was a mere US\$8. A mylar one would have been US\$3.



Figure 11 - Solder Paste and Reflow Equipment

### Solder Paste

Solder in paste form has the same electrical properties as the rolls of solder we all know and love, but the tin and lead (or lead substitute, if you choose to use lead-free solder) is suspended in a resinous gel that gives the solder paste the consistency of very thick peanut butter. Don't put it on toast, though! See Figure 11.

You place the stencil on top of your PCB (See Figure 10 again) and then “squeegee” the solder paste across the stencil using a ruler or small plastic card (supplied free by the OSHStencil people with every order!). Lift the stencil and the board is pasted. Excess solder paste can be saved and used again.

Solder paste comes in a tube or syringe, or in a small jar as shown in Figure 11. Keep your solder paste in the refrigerator until about a day before you are going to use it. This keeps the paste from drying out.

The small tube or syringe of solder paste will be just what you need as a beginner surface mount hobbyist. The three or four cm<sup>3</sup> of solder paste in the tube will go a long way when doled out “one pad at a time” on your circuit board.

### Placing Parts

Once your board has been pasted, it is simply a matter of placing the surface mount components on the appropriate pads on your printed circuit board. Use the schematic and board layout from your project to put each little surface mount part onto the correct pads

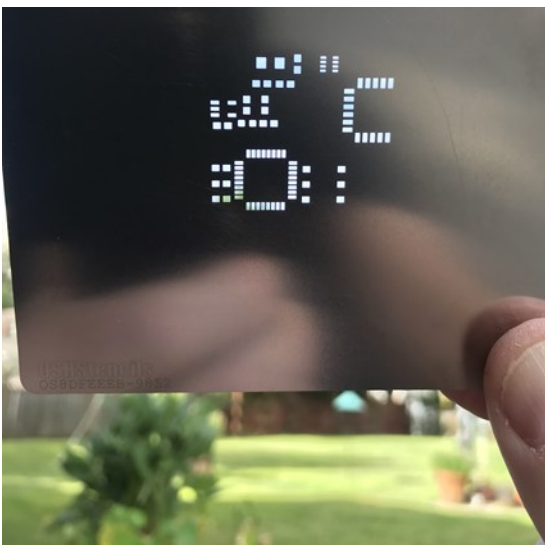


Figure 9 - A Steel Stencil

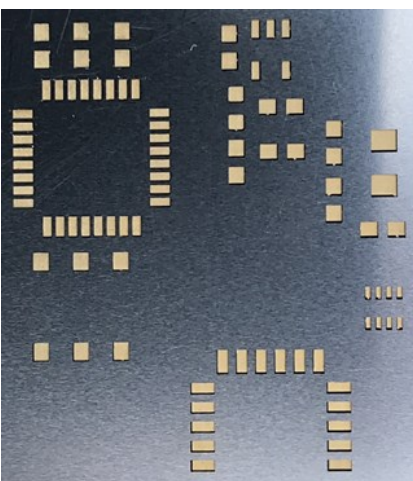


Figure 10 - Stencil Aligned Over PCB



using tweezers. This is tedious at first, but with practice you get really good (and fast) at it. I use a handheld lighted magnifying glass to check and recheck my placement work.

It is not important to achieve great accuracy when placing the parts onto their pads, as long as the correct part is on the correct pads. If the part is touching the pads (and solder paste) where it is supposed to go, the reflow process causes the solder paste to “suck” the parts into perfect alignment on the PCB using surface tension when the solder paste melts.

This is actually an **amazing process to watch** if you look into your reflow oven through its window as the temperature reaches the reflow temperature, usually about 253 degrees C.

*There is a fantastic short video at <https://www.youtube.com/watch?v=LCmia0Wsmqg> showing solder reflow and parts realignment in action on YouTube. If you consult only one resource from this article, this is the video to watch. The way the parts align themselves when the solder reflows is amazing!*

### Reflow Ovens

A critical component in doing surface mount work at home is your reflow oven. A reflow oven is a device that is able to expose pasted circuit boards that have all the parts placed onto the pads to a standardized “temperature curve” that heats the board, melts the solder paste, and then cools the board down in a tightly-controlled manner. Figure 12 shows a typical home reflow oven for sale on eBay.

Reflow ovens typically have several pre-programmed temperature curves that depend on the type of solder paste being used: one curve for lead/tin solder paste, a different one for lead-free solder paste, for example. Each curve includes a warm-up phase, a reflow phase, and a cool-down phase. The reflow phase holds the board at approximately 253 degrees C for about 15 seconds to allow the solder to “reflow” and suck the component onto the PCB pads.

Accuracy in the reflow oven’s temperature curve is critical, because the solder paste will not reflow properly if it and the surrounding PCB pads and parts are not properly pre-warmed. Similarly, if the board is not cooled in a correct manner, the soldered pads can crack and later generate intermittent circuit problems in the PCB.

It is important to do your research and buy a fairly high-quality home reflow oven. Ask me for assistance via [mcquiggi@sfu.ca](mailto:mcquiggi@sfu.ca).

Beginners should NOT attempt to use frying pans, re-worked toaster ovens, or any of the other misguided “cheap” approaches to home-based solder reflow circulating on the YouTube or the Internet. These rarely work well and are not worth the trouble.

A very good home-level reflow oven such as the unit in Figure 12 can be purchased on eBay for under US\$300. At this kind of price do not waste your time (and your PCBs, and components, and solder paste) trying to do solder reflow in a skillet on your stove!

Figure 13 shows my own reflow oven, a Puhui T-962. I bought it on eBay about four years ago after much research. This oven has successfully reflowed over 200 boards for me with no problems at all. The Puhui company has a pretty good reputation for quality home reflow equipment. The manual lost a bit in its translation to English from the original Chinese, but you can figure out the directions without much trouble. The company also offers good support, although I have not had to contact them myself.



Puhui T962A INFRARED reflow oven  
Brand New

**\$257.77**

Buy It Now

6 watchers

Watch

Figure 12 – Home Reflow Oven



Figure 13 - VE7ZD's Reflow Oven

### Resources

I've included lots of references in this article, but it is worth adding that the SARC Elmer group can also offer assistance in this and many other areas of amateur radio and equipment/circuit design. I would be happy to answer questions on surface mount and home reflow via email, phone, or even on the repeater or at a club meeting once the COVID-19 restrictions are eased.

The important thing is to realize that you can use reflow technology at home, and that it offers many advantages for "professionalizing" your circuit designs. It is also important for us as hams to keep abreast of modern technologies. Reflow is easy and fun!

Industry now uses surface mount techniques almost exclusively: through-hole circuit boards have been relegated to the dustbin because of their higher cost and lower reliability.

### References

- [1] <https://www.tempoautomation.com/blog/a-brief-history-of-printed-circuit-boards-design-and-manufacturing/>
- [2] [https://en.wikipedia.org/wiki/Surface-mount\\_technology](https://en.wikipedia.org/wiki/Surface-mount_technology)
- [3] <http://www.surfacemountprocess.com/>
- [4] See <https://mouser.com> or <https://digikey.com>
- [5] [https://www.electronics-notes.com/articles/electronic\\_components/surface-mount-technology-smd-smt/packages.php](https://www.electronics-notes.com/articles/electronic_components/surface-mount-technology-smd-smt/packages.php)
- [6] <https://leeselectronic.com/en/product/16530.html>
- [7] <https://www.autodesk.com/products/eagle>
- [8] <https://kicad-pcb.org/>
- [9] <https://oshpark.com>
- [10] <https://oshstencils.com>
- [11] "Make Your Own PCBs with EAGLE: From Schematic Designs to Finished Boards" by Simon Monk, available at <https://amazon.com>

In industrial factories, robots place sub-millimeter surface mount parts on circuit boards in large production lines that can produce thousands of finished boards per hour. These are called "pick-and-place" machines and they are fascinating to watch.

See [https://www.youtube.com/watch?v=S8qkaTsr2\\_o](https://www.youtube.com/watch?v=S8qkaTsr2_o) for a demonstration of a high speed pick-and-place machine. An older, slower pick-and-place machine can be seen at <https://www.youtube.com/watch?v=hC3HOcsEKlk>.

As progressive amateur radio hobbyists, we should all know a bit about this process.

### Summary

I hope that you have gained new insight into solder reflow and how the technology (and process) work. Solder reflow is just one more example of a previously complicated and expensive industrial process which has now successfully migrated to be within reach of the amateur radio hobbyist at home.

I'm always happy to answer questions. In fact, if you want to give solder reflow a try for your next project, then just let me know - I will help you get started with Eagle, send your boards for fabrication, and teach you how to place parts. You can even use my "old reliable" Puhui reflow oven here in Burnaby to make your first boards! This will help you get started with reflowing at minimal expense.

That's it for this month! Feedback on this article can be directed to the Editor, or directly to me at [mcquiggi@sfu.ca](mailto:mcquiggi@sfu.ca).

73,  
~ Kevin VE7ZD / KN7Q

Daniel Romila VE7LCG

# Daniel's Workbench

## Short and Simple Analog - Digital Conversion Theory

This article has more of a practical purpose than a theoretical one. It will bring just enough theory in order to help the reader decide what equipment to buy and for what characteristics to look. For example, analog — digital conversions are used in computer audio path, in audio external sound cards connected on the USB port, USB headsets used for EchoLink, Skype and other communications purposes. The next picture shows a MPOW HC6 USB headset, just to give an example of what I am writing about:

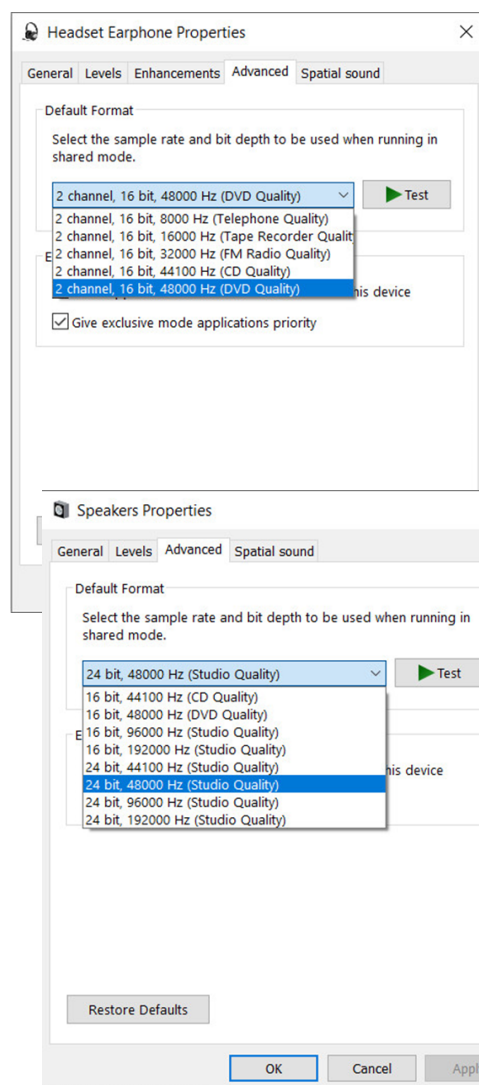


I do not have this headset, but I have a similar Plantronics BlackWire 320. Let's see what this

headset knows to do, from the analog-digital conversion point of view. The Windows 10 operating system knows to show "properties" for its audio components, in my case a Plantronics BlackWire 320 [right]

The picture shows my headset is a stereo one (it has "2 channels") and it knows to function in 5 modes. For the moment, just keep in mind that bigger numbers mean better quality. So, 16 bit per sample, at 48,000 samples per second looks good. That is DVD quality, which is above CD quality. The lowest quality in the picture is "Telephone Quality", and telephone quality is already above what radio amateurs are allowed to use in their communications.

If you look only at the picture, the selected analog-digital conversion from the USB headset is impressive. It is one step above CD quality. We listen to CD quality music every day and we are happy with it. But let's have a look at the similar Windows 10 display for the internal sound card of a simple computer, post Pentium 4 era [lower right].





The picture shows that the internal analog-digital converter used for the audio path inside the computer is way above the USB headset's characteristics. It knows 24 bits instead of just 16, and up to 192,000 samples per second, instead of just 48,000 samples per second. This is exactly 6 times better than the USB headset Plantronics knows. It simply leaves almost any external audio device in the dust .

But, before jumping and throwing all external digital audio devices connected to your computer's USB port in the garbage, please keep in mind:

- USB headsets are meant for voice communications. It would not be useful to go way above CD quality.
- External USB devices are external, and they are connected to USB. So whatever fast analog-digital converter is inside those external devices, they will be bogged down by the limited speeds of the USB ports. The majority of those USB external devices try to be backward compatible with USB 1.1 computer ports, so you can imagine how low the characteristics of their analog-digital converter, in comparison with what electronics engineers would actually be able to put there.

A normal question would be: "but is there any difference between 16 bit 48,000 sample by second and 24 bit 192,000 samples by second, if I listen to music?" Yes, there is. If one listens to CD quality, he/she is happy. And when the same song is played at 6 times better analog-digital conversion quality, you would say that "the real thing" was finally put on. Let's not forget that the CD audio quality standard is less than the analog LP (long play) old analog vinyl discs are.

### ***The theory starts here***

Analog signals are signals that can have any value. Sounds are analog signals (we hear only analog, so it does not matter how that sound was produced). When I say that an analog signal can have any value that means - for example - the sound can be just a little louder

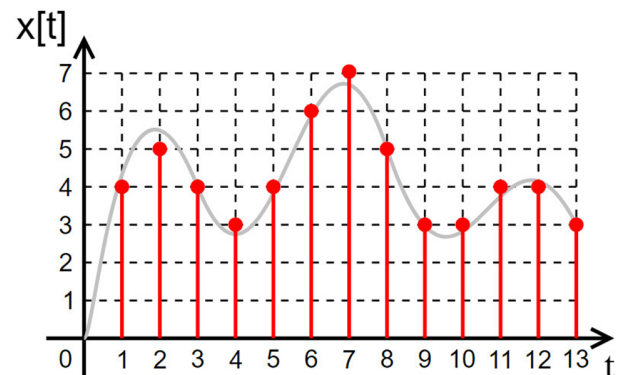
or a lot. And anything in between. Absolutely any value in between. (Digital signals can have only certain values, and they increase and decrease in steps, not with arbitrary values.)

### ***From Wikipedia:***

"An analog signal is any continuous signal for which the time-varying feature (variable) of the signal is a representation of some other time varying quantity, i.e., analogous to another time varying signal. For example, in an analog audio signal, the instantaneous voltage of the signal varies continuously with the pressure of the sound waves. It differs from a digital signal, in which the continuous quantity is a representation of a sequence of discrete values which can only take on one of a finite number of values. The term analog signal usually refers to electrical signals; however, mechanical, pneumatic, hydraulic, human speech, and other systems may also convey or be considered analog signals."

"A digital signal is a signal that is being used to represent data as a sequence of discrete values; at any given time it can only take on one of a finite number of values."

I also took the following graphical representation from Wikipedia:



The analog signal is the grey one. The red dots (without the red lines) represent the digital approximation of the analog signal. One can already notice here:

- The approximation of the grey analog signal is better and better if we would

have more and more red dots. That means the more samples we could take in a second, the better the approximation. There is a sampling theorem, which says that the sampling frequency must be at least twice the frequency of the analog signal we try to approximate. For audio, if we want to reproduce 22 KHz (22,000 Hz) sung by a soprano, we should use at least 44,000 samples per second.

- The red dots for the samples 1 and 3 are close to the real grey analog values. Not so much for the samples 2 and 7, for example. Remember, the analog signal can have any value, while the digital one has just a set of values. The digital signal has to approximate the real value with what it knows in its limited set of values. That kind of approximation error is called “quantization noise”, or the digital noise of the sampling

process. The more possible values we have in our digital set of values, the closer the approximation. If we dedicate only 1 bit we can approximate with all (1 logic) or with nothing (0 logic). That is brutal. For 2 positions (that is 2 bits) binary numbers used in computers we have 2 at the power 2 equaling 4 possible values. That is still brutal. But 16 bits would give us 2 at the power 16 set of values, that is 65,535. 24 bits looks even better, with more than 16 million possible approximation values (16,777,216).

I intended to touch just the sampling frequency in this article, how many bits are dedicated for a sample (how many estimated values there can be) and the sampling (quantization) noise and the practical application for sound cards, USB sets we use in ham radio communications.

~ Daniel VE7LCG



We have heard that SARC member Chris Cowx VA7CWX, has been in hospital with medical issues and is now recuperating at home. We would like to wish him well and hope that he is on his way to recovery.

All the best Chris from your friends at SARC.

Daniel Romila VE7LCG

## Daniel's Workbench

...continued



## USB Headphones For Communications

Since many now use EchoLink and remote interfaces for their transceivers, computer headsets became interesting for radio amateurs. I was asked if USB headsets are better than analog headsets. To answer this question, I will start by showing a picture of the USB headset I have [below].

I have a Plantronics Blackwire headset, which was rated as the best in 2020 by <https://headphonescompared.com/the-best-usb-headsets/>

I have the model 320 from this family, and I suspect they now have something newer, but anyhow, I am close to what it is declared as best.

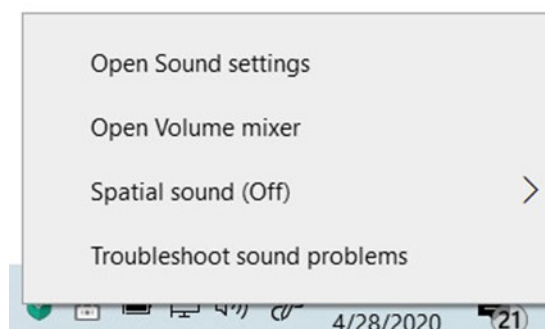
I confess that I took the headset from the garbage bin, and that it was OK except for lack of earpads. An easy fix with generic earpads, black foam, from Dollar Tree, C\$1.25 plus taxes. (For those that are already jealous of the above, I should mention that several years ago I also got a 55 inch Samsung 4k LED

TV, for the price of an Insignia 32 inch TV, because the store mismanaged transport and wanted to correct the mistake they made).

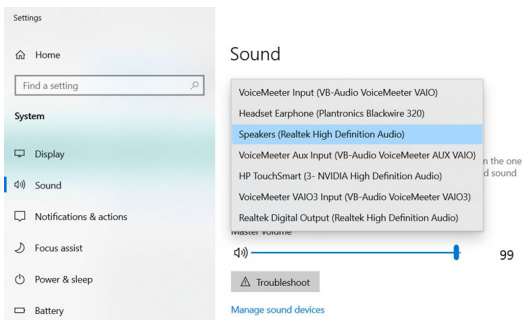
But to answer the question... **is this USB headset better than a pure analog one?**

I do not think so. If you look at the picture, the headset is an analog headset, with long wires that collect noise as much as any pure analog headset would collect. After a certain length (about 60 cm), those wires enter a plastic box, where the conversion of analog to digital and vice versa happens. I do have some dedicated buttons for communication, which I personally never use. I prefer to use EchoLink with its default Tx/Rx switch, which is the space bar from the keyboard. The more apparatus introduced in the chain, the less reliable everything is. If a gizmo is not essential for me (or loveable for me, even if completely redundant), I do not use it.

The Plantronics headset I have is an analog headset plus an external USB audio card. This is what it is, nothing more. When I plug the USB headset in, it is automatically recognized by Windows 10, and most USB headsets would be. If you do not need whatever esoteric functions that come only with the manufacturer's own driver, no other driver needs to be installed. If I right-click in the lower right corner of the Windows 10 taskbar, on the speaker icon:







If I select the upper line, “Open Sound settings”, I can verify that a new audio output and audio input appeared in the system [top right].

And, respectively, for the microphone part [lower right].

My headset has stereo headphones and a mono microphone. It is light and comfortable to wear. The best sound I would eventually obtain from it would result from cutting off the USB component box and plugging the analog connectors into the computer’s dedicated IN and OUT ports. The sound card I have inside the computer is better than what the USB headset has.

This would not make much difference, anyhow, since the active headphone elements are 30 mm diameter, totally

inappropriate for high fidelity music, but more than OK for voice and communication, where to be light and small is more important than high fidelity (what HiFi in ham radio communications, with limited bandwidth?)

In order for a USB headset to be less noisy than a pure analog headset it would need to have the analog to digital converter electronics inside the plastic cups of the headphones and immediately next to the microphone capsule. I could not find any such headset.

and many-many other websites there are plenty of external sound cards. Some are under C\$0.97 (shipping and taxes included), but very basic. Do not believe the “3D sound” logo; it is just about the software that it comes with. Your computer most likely already has such software built into the operating system.

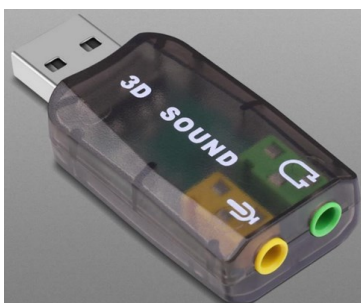
Other boards, around C\$5-6 (shipping and taxes included) are more sophisticated, with some buttons and functions that might or might not be useful [right].

This one has a built in equalizer that can be bypassed, 3 LED indicators, and 3 connectors. Everything for C\$5.61, shipping and taxes included.

If you want a gizmo with volume control in it would cost more, some C\$15-17, shipping and taxes included [right].

What I actually look for in an external sound card is the ability to handle digital input and output, and at high bit rates. None of the external sound cards already presented above can do that. That means no real 5 + 1 sound. Only fake surround. No real separate bass, not even real 2 +1 signals (LEFT, RIGHT, SUBWOOFER). But the next one, at about C\$17 shipping and taxes included, will do [right].

It really looks like an external sound card made by Creative Labs that I used for many years, and I suspect the electronics inside is very similar.



If you have a decent audio sound card in your computer and good connectors, you do not need an expensive USB headset. A normal analog one would do a better job, and it would not consume supplementary power. The situation changes if you really need an external sound card. On eBay, aliexpress.com, banggood.com, gearbest.com, dxengineering.com

Now I keep a Turtle Beach Micro Advantage Micro USB as a spare audio board. It only has an output for analog headphones and into the same connector you can insert an optical fiber cable. It is capable of a digital stereo signal, but not a 5 +1 true digital mix signal.

The analog audio power generated by this board far exceeds all computers I have now or had in the past, so it can be used with your analog headset if it has high impedance elements and the current sound card from your computer cannot deliver enough audio power.

In conclusion, while USB headsets give absolutely no advantage over pure analog ones, the particular situation like a damaged internal audio path in your computer, and/or damaged connectors can make USB headsets and USB external sound cards useful for your communication needs.

~ Daniel VE7LCG



## Deep 'Solar Minimum' is feared

*Forbes Magazine*

**Forbes magazine reports a deep 'Solar Minimum' is feared as 2020 sees a record-setting 100-day slump...**

Jamie Carter writes:

While we on Earth suffer from coronavirus, our star—the Sun—is having a lockdown all of its own. Spaceweather.com reports that already there have been 100 days in 2020 when our Sun has displayed zero sunspots.

That makes 2020 the second consecutive year of a record-setting low number of sunspots. So are we in an eternal sunshine of the spotless kind?

Read the full article at

<https://www.forbes.com/sites/jamiecartereurope/2020/05/12/the-sun-is-asleep-deep-solar-minimum-feared-as-2020-sees-record-setting-100-day-slump/>



Daniel Romila VE7LCG

Daniel's  
Workbench

...continued

## The Story Of The Radio Hat—1949



In 1949, Victor Hoeflich held a press conference to introduce the “Man from Mars, Radio Hat”. Hoeflich knew a picture would tell the story so he had several teenagers modeling the radio hats for the reporters and photographers. Soon pictures and news stories appeared in newspapers coast to coast. The articles typically included a photo of a young lady wearing the hat and a six-paragraph story.



Battery-operated portable radios had been available for many years, but Hoeflich hoped a radio with innovative packaging and a publicity campaign could be a runaway success.

Although the radio hat had a futuristic appearance at the time, this was in fact due to technical limitations. While the transistor had been invented in 1947, it was still experimental and not widely available. The hat's radio relied on vacuum tube technology, and Hoeflich made the tubes a prominent feature, as well as the loop aerial. The tuning knob



*The radio hat was a portable radio built into a pith helmet that would bring in stations within a 20-mile (32 km) radius.*

*It was introduced in early 1949 for \$7.95 as the “Man-from-Mars Radio Hat.”*

*Thanks to a successful publicity campaign, the radio hat was sold at stores from coast to coast in the United States.*

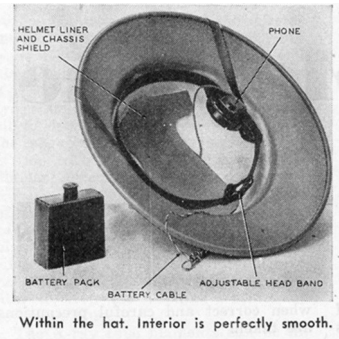
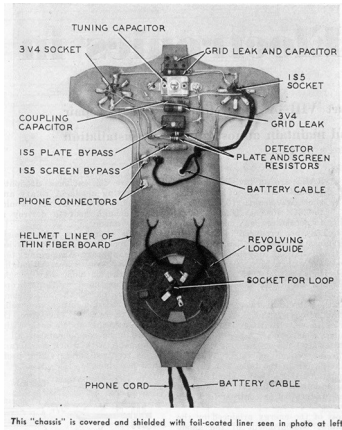
sat between the two valves. The battery was carried in the user's pocket.

The radio hat was sold in department stores and by mail order. A Van Nuys, California service station chain sold the hats as a promotion item to customers who purchased gasoline. The radio hat retailed for \$7.95. Designed after a pith helmet, it could be ordered in eight colors: Lipstick Red, Canary Yellow, Blush Pink, Rose Pink, Tangerine, Flamingo, Chartreuse and Tan. Later seven more color options were added.

The massive publicity did not lead to lasting sales. Advertisements for the radio hat stopped in early 1950. Its failure was primarily due to technical limitations. It had only two valves, while household radios featured five or six, and thus, performed better. The loop antenna was directional and signal could be lost as the user turned his or her head. The Radio Hat had an advertised range of 20 miles; sometimes when tuning, it picked up stations further away, but these would be received as an annoying squeal, as the hat did not have the necessary circuitry. In a 1956 interview, Hoeflich said the company still got orders for the hat even though it was long out of production.

~ Courtesy <https://rarehistoricalphotos.com/> and Radio-Electronics, June 1949, Volume 20, Number 9, From page 33.





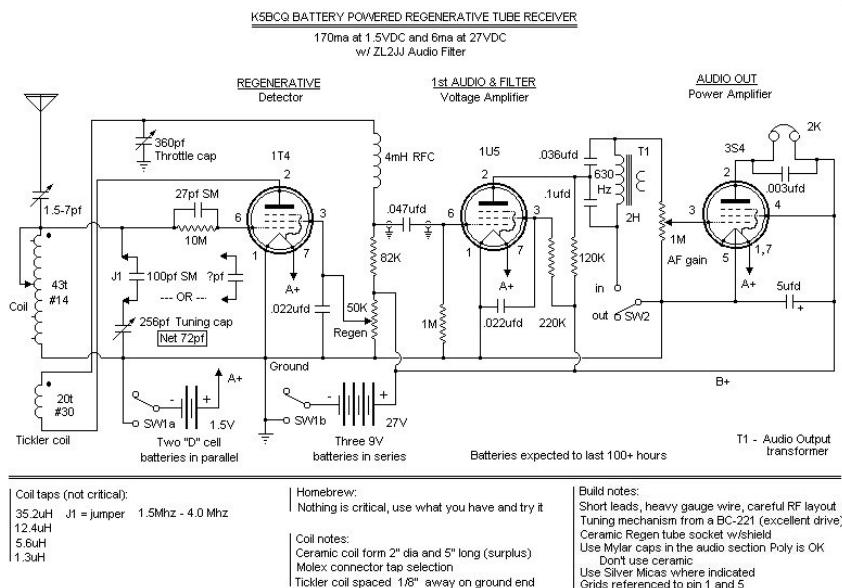
The radio hat was manufactured by American Merri-Lei Corporation of Brooklyn N.Y.

Battery-operated portable radios had been available for many years, but Hoeflich hoped a radio with innovative packaging and a publicity campaign could be a runaway success.



I sent an advance copy of this article to Daniel VE7LCG. He commented:

"1R5 was the name of the heptode. It took me a while to remember. Attached a schematic in the same line as 'the radio hat'." - Ed.



Daniel Romila VE7LCG

# Daniel's Workbench

...continued



## The Electronic Vacuum Tube Temptation

I remember many happy hours of building ham radio projects with tubes. I never made a full super heterodyne receiver, but I made audio amplifiers with pentodes, triode-pentode, oscillators, converters and regenerative and super regenerative receivers.

At the time I considered that they worked great. It was OK for me to tremble, with both hands on the tuning knob and on the regenerative adjustment knob, in order to receive the same station. It was kind of fun, especially that it was in Europe and there were plenty of stations. So what if the frequency went off a little? There was always another radio amateur on a nearby frequency.

*And yes, I remember the electric shocks I took several times from capacitors that remained charged at high voltage. That is something to avoid.*

After I saw a squirrel digging out the flowers just planted around my building in order to recover a peanut, I remembered the acorn type tubes, called nuvistors. They were similar to a peanut shape and size. There were plenty of Russian tubes 30 - 40 years ago. The army was unloading the old Russian equipment, so plenty of vacuum tubes became available everywhere.

By the way, I put back the flowers the squirrel took out, and did not tell anybody about it.

Browsing for these acorn tubes on the Chinese websites I was again impressed by the elegance of the 850 and 829 tubes, encountered by chance in my search for other type of tubes. I used their

Russian versions, called GU50 and GU29.



These pictures are not of old tubes. They are brand new ones, made in China currently in 2020, under the names FU50 and FU29.

Russia also has an active well known manufacturer of electronic vacuum tubes, "Svetlana", in St. Petersburg. FU29, GU29 and 829 have two anodes at the top of the glass container, for its two tetrodes. I remember that this tube wanted to work only in a vertical position, and self-oscillated whenever it was not in a vertical position (as also stated in the manufacturer's datasheet). High plate voltage, like 1 kV to 1.5 kV were applied to those RF final tubes.

(People still hunt for damaged microwave ovens, in order to take from there the high voltage power

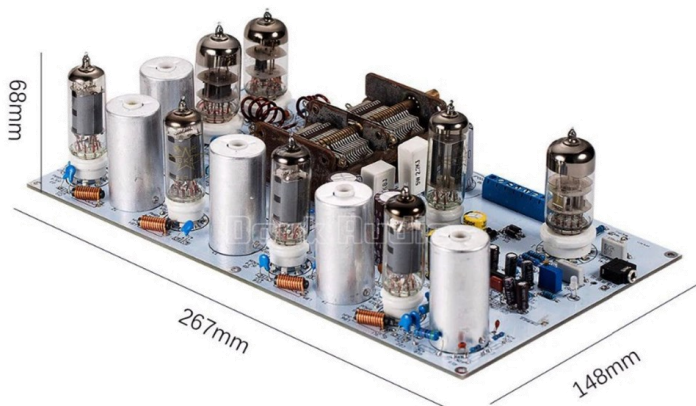
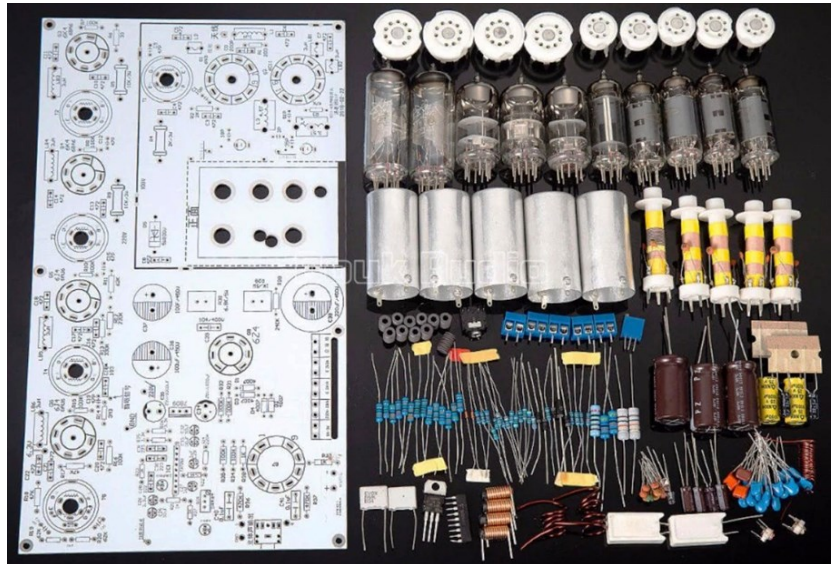




supply, although they have to “fix” it. This is necessary to transform it from a variable voltage source to a fixed voltage source.)

*And yes, I remember the electric shocks I took several times from capacitors that remained charged at high voltage. That is something to avoid. If I will start building projects with tubes again, I will use lower plate voltages.*

An immediate problem for making projects with tubes would eventually be finding a power supply strong enough to provide some Amps for the heater (filament) and high voltage(s) for the plates. Buying such components at a reasonable price and getting them from China or Russia would be a postal hassle. Even the kits with tubes available all over on Chinese websites, avoid this problem. The kit radio presented in the following picture includes everything except the transformers/power supply:

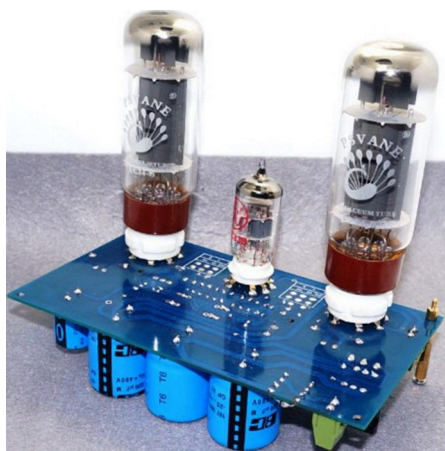


Such an FM stereo radio kit is around C\$220 (shipping and taxes included) if it is already assembled and around C\$160 if it is only a DIY kit. I wonder if it would arrive without damage from China into Canada. In order to avoid stereo decoding with tubes, the kit uses a TA7343 decoder integrated circuit. There is a headphone jack, used only to provide the audio signals to an external power amplifier. Because there is no onboard tube amplifier there are no speaker transformers required. Tubes have high impedance outputs, and ‘usually’ require transformers (please continue reading) to connect normal 4 Ohm - 8 Ohm speakers.

The above radio kit is sold in so many places, that any Internet search will pop-up results. One place with more pictures and the schematic at the end of the page is:

[https://www.aliexpress.com/item/32678549529.html?spm=a2g0o.detail.1000014.41.59b65125OVLbgW&gps-id=pcDetailBottomMoreOtherSeller&scm=1007.13338.170517.0&scm\\_id=1007.13338.170517.0&scm-url=1007.13338.170517.0&pvid=d29343cd-ab3b-4e36-9e35-321fdf08ad69&t=gps-id](https://www.aliexpress.com/item/32678549529.html?spm=a2g0o.detail.1000014.41.59b65125OVLbgW&gps-id=pcDetailBottomMoreOtherSeller&scm=1007.13338.170517.0&scm_id=1007.13338.170517.0&scm-url=1007.13338.170517.0&pvid=d29343cd-ab3b-4e36-9e35-321fdf08ad69&t=gps-id)



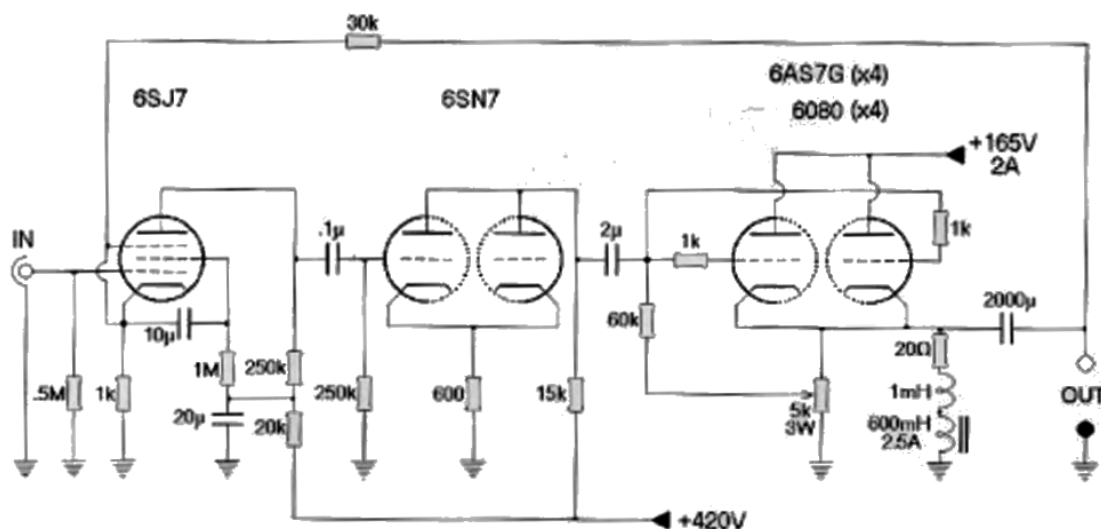


A classic audio amplifier [above], with its transformers, two final EL34 tubes and a double-triode 6N2 tube would cost another C\$150. This starts to become a very expensive adventure, building with tubes, due to the final transformers.

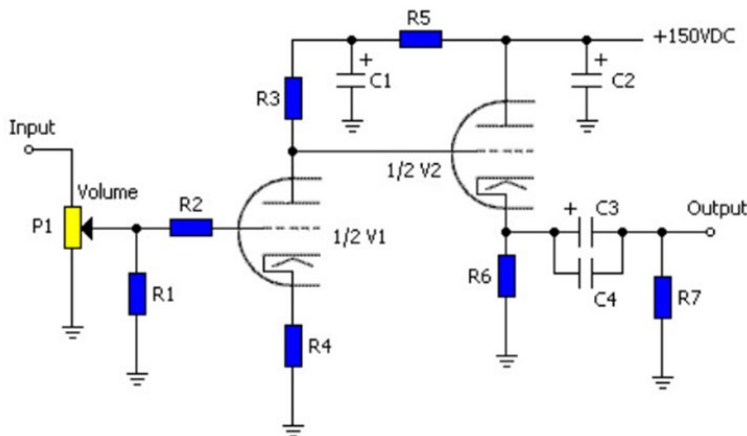
Without the audio transformers it would be in the C\$25 CAD - C\$29 range:

I like to keep my electronic projects cheap, no more than C\$50 - 100. That seems possible if somehow I got rid of the final audio transformer and the transformer for plate high voltage.

There are tube audio amplifiers without final transformers. They are called OTL (output transformerless) amplifiers. Below is a Japanese schematic from 1952.



The output is taken from the cathode. What I do not like is the high voltage required for such a schematic. A version of the above is present in many variations on many websites dedicated to OTL amplifiers:

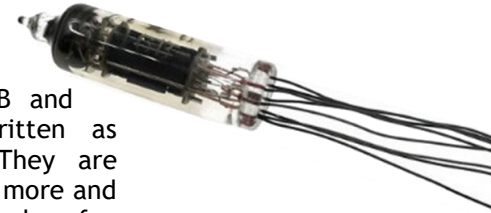


websites dedicated to normal vacuum tubes “convinced” to work from a 150 V anode voltage down to 12 - 24 Volts while still providing good functionality.

I even found small tubes that do not require sockets.

Such well known subminiature tubes are 6021 and 6112 (6N16B and 6N17B, eventually written as 6H16B and 6H17B). They are double triodes. It looks more and more tempting to do fun projects with tubes, investing just a few dollars.

It already started to look promising when the picture became even better. There are tubes that were designed from



The original schematic [above] is attributed to Rudy van Stratum, who published it in the April and September 1995 issues of the Dutch magazine Audio & Techniek. OTLs take the output from a cathode. The speaker or headphones are separated from the DC high voltage through a capacitor. There is also a resistor connected to ground which reduces the tendency of self-oscillation when nothing is plugged in at the output, and also (somehow) protects the user.

And yes, I remember the electric shocks I received several times from capacitors that remained charged at high voltage. That is something to avoid.

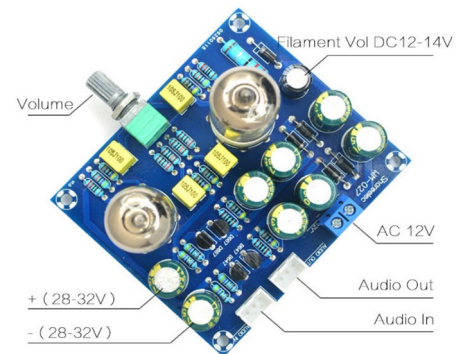
I already decided that hundreds of volts is not something that I will use in my projects. Chinese websites sell audio preamplifiers with a 6N3 double triode tube power supplied at the anode with just 12 V, and users report it works [photo middle right].

Similar, there are preamplifiers with two small 6J1 pentodes, also supplied with only from 12 V [photo lower right].

The possibility of lowering the power supply voltage from hundreds of volts to 12 - 24 Volts is very attractive. Such projects would be less prone to mishaps. There are many

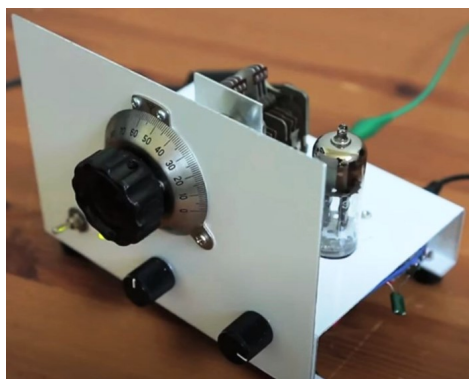


the very beginning to work at 12 V for both the heater and the plate circuits. These tubes worked on something called the “space charge” principle, which basically used the first grid after the cathode to accelerate electrons toward the weakly-



charged plate, which was now working at only 12V instead of 180V.

Between 1958 and 1962 Tung-Sol, GE, RCA and other manufacturers released quite a few different types, all in 7- and 9-pin miniature packages. Virtually all of these tubes were designed for RF work up to reasonable HF frequencies. Note that there are no true power amplifiers in the lineup. Getting a tube to output significant power with 12V on the plate is almost impossible. Nonetheless, if you're content with headphones or QRP operation, the space-charge 12K5 driver tube can source as much as 35 milliwatts at either audio or RF. (taken from <http://www.junkbox.com/electronics/lowvoltage Tubes.shtml>)



All those 12 V tubes have the number 12 in front of their name. An extensive table with what tubes are available in the car tubes series can be found at:

[http://www.angelfire.com/electronic/funwithtubes/12v\\_tubes.html](http://www.angelfire.com/electronic/funwithtubes/12v_tubes.html)



Somebody named Chappy Happy presented a one tube FM super regen receiver built around a 12BH7A tube on YouTube.com:

[https://www.youtube.com/watch?v=B8W\\_IsCJ0C0](https://www.youtube.com/watch?v=B8W_IsCJ0C0)

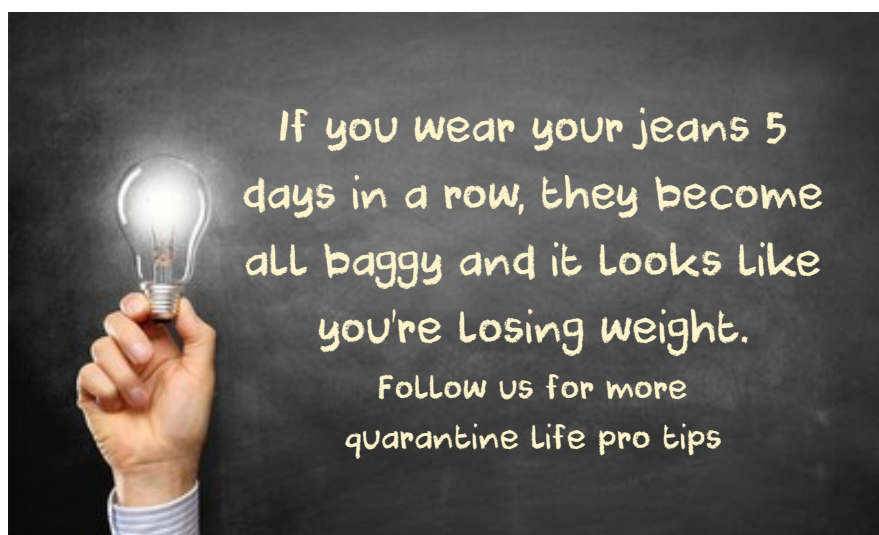
Somebody else, under the name QRP QRP posted a receiver with a normal ECC82 (12AU7) tube, convinced to work at 12V on YouTube.com:

<https://www.youtube.com/watch?v=OVaeKucfDoQ>

There are many websites selling tubes, not only the Chinese ones. One place with big variety and cheap prices is: <https://tubes-store.com/>

My only concern is that glass tubes will arrive broken in my mailbox. Maybe I should use ceramic tubes, like the triode 6SK17-W?

~ Daniel VE7LCG





Daniel Romila VE7LCG

# Daniel's Workbench

...continued



## From Datasheet to Practical Project

Note: The final project, in a case and in operation, can be seen at: <https://www.youtube.com/watch?v=fDfT2gDvR0c>

A higher resolution schematic is at: <https://github.com/danielromila/Light-organ-with-MCR100-tyristors>

In order to keep my practical skills, I often do the following exercise: I browse the Chinese websites

for various electronic components, until I find something that sparks my interest. After that I look for a SPICE model, to be able to simulate that interesting component in a CAD (Computer Aided Design) program. I draw a schematic for something, I simulate it and I do something practically.

**The SPICE model for MCR100-8 thyristor can be found on Internet, but here it is:**

```
* TERMINALS: A G K
* 600 Volt .8 Amp SCR 07-17-1995
QP 6 4 1 POUT OFF
QN 4 6 5 NOUT OFF
RF 6 4 120MEG
RR 1 4 80MEG
RGK 6 5 6.25K
RG 2 6 9.17
RK 3 5 81.3M
DF 6 4 ZF
DR 1 4 ZR
DGK 6 5 ZGK
.MODEL ZF D (IS=.32F IBV=1U BV=600 RS=18MEG)
.MODEL ZR D (IS=.32F IBV=1U BV=800)
.MODEL ZGK D (IS=.32F IBV=1U BV=5)
.MODEL POUT PNP (IS=320F BF=1 CJE=67P)
.MODEL NOUT NPN (IS=320F BF=100 RC=.325
+ CJE=67P CJC=13.4P TF=56.6N TR=8.06U)
```

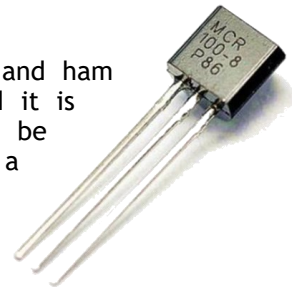
It is a good electronics and ham radio skills exercise. And it is also something that can be shown to others; and it is a learning process in which I learn from others and others can learn from it.

Sometimes the final product is something radio related, other times it is not, like a light organ. While one can ask what is the connection between a light organ and ham radio, apart from pure explanatory aspects (it contains switching; microphone audio amplifiers; electronics design; soldering skills, and so on), many young people were introduced to ham radio by flashy simple things (light organs, for example) that attracted them first. Once the interest was there, more sophisticated, radio things could follow.

SARC Communicator readers know I presented light organs in several past editions (details at the end of this article). But let's follow the process I just described in the first paragraph.

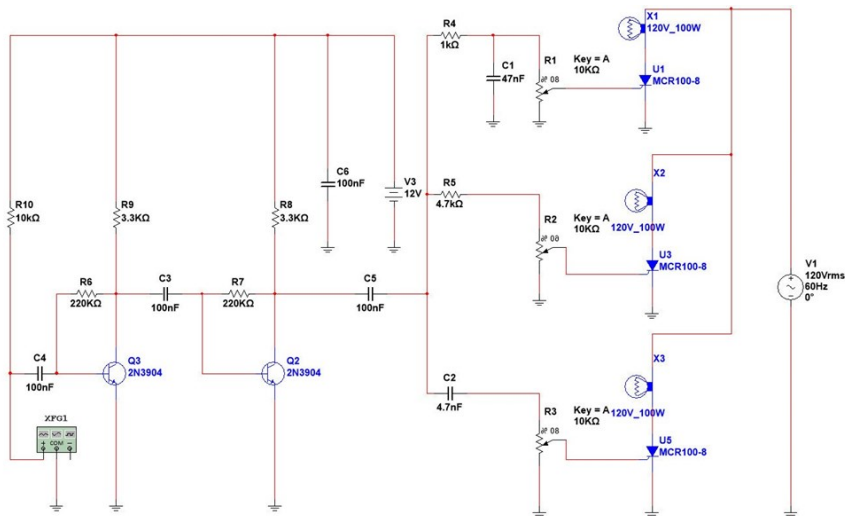
I found a cheap and common thyristor, MC100-8 for around 3 Canadian cents a piece, shipping and taxes included.

What is interesting in this component is its sensitivity. Almost any signal at the gate can trigger it (millivolts, at microamps) [table below].



|                                                                                                           |                        |                 |     |     |       |
|-----------------------------------------------------------------------------------------------------------|------------------------|-----------------|-----|-----|-------|
| Gate Trigger Current (Continuous dc) <sup>(2)</sup><br>(Anode Voltage = 7 Vdc, R <sub>L</sub> = 100 Ohms) | T <sub>C</sub> = 25°C  | I <sub>GT</sub> | —   | 200 | μA    |
| Gate Trigger Voltage (Continuous dc)<br>(Anode Voltage = 7 Vdc, R <sub>L</sub> = 100 Ohms)                | T <sub>C</sub> = 25°C  | V <sub>GT</sub> | —   | 0.8 | Volts |
| (Anode Voltage = Rated V <sub>DRM</sub> , R <sub>L</sub> = 100 Ohms)                                      | T <sub>C</sub> = -40°C |                 | —   | 1.2 |       |
|                                                                                                           | T <sub>C</sub> = 125°C |                 | 0.1 | —   |       |

The complete datasheet can be found in many places, including:  
<https://www.futurlec.com/Diodes/MCR100-8.shtml>

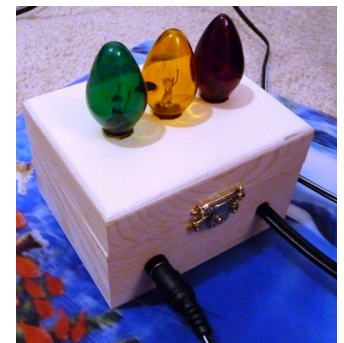


So, my intention to simulate it in Multisim, for example, was a reasonable achievement. I decided to buy one-hundred MCR100-8 thyristors, and use them in various switching functions. I also decided to make another light organ with them, since they are so sensitive. The schematic, after tuning the values of the components in Multisim, is shown above *[click to enlarge]*.

The light bulbs are up to 15 Watts marked power. Thyristors will conduct only for a half of the AC sine wave coming from the power outlet, so do not expect big light from this organ. The thyristors themselves are low power and I did not feel like forcing them.

While in the above schematic I used the built-in audio signal generator from Multisim, in actual practise I used a condenser microphone. This type of microphone requires power supplied, and this is the purpose of R10 (10 Kohm).

After I finally got the electronic components from China, I built the final project. You can see it in operation at: <https://www.youtube.com/watch?v=fDfT2gDvR0c> *[two photos right]*.

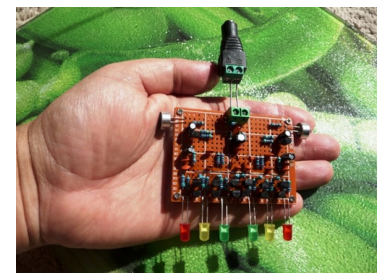


An organ which can activate stronger light bulbs, made with triacs that were not very sensitive (really, not at all), was described in the SARC Communicator March 2018, page 29, at the very end of that article at URL *[photo left]*.

<https://drive.google.com/file/d/1KTzQ-Fteh0Wge2bxh2v3ZHsyAcHqsYjP/view>

As mentioned at the beginning of this article, in the SARC Communicator I already presented other light organs, see 'LED stereo organ', all power supplied from 12 V SARC, December 2018, page 27 at URL *[photo right]*.

[https://drive.google.com/file/d/1cEcXlUV\\_vNMkhf\\_3JRmFZma-B6vU00-O/view](https://drive.google.com/file/d/1cEcXlUV_vNMkhf_3JRmFZma-B6vU00-O/view)





Daniel Romila VE7LCG

# Daniel's Workbench

...continued

## Making Your Own QSL Cards...

How to make electronic QSL cards using Microsoft Word



The purpose of this article is to show you how to make a QSL card like this:

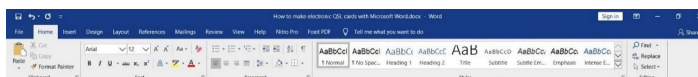


On the lower left corner I put a picture of a squirrel, but it should probably be your picture.

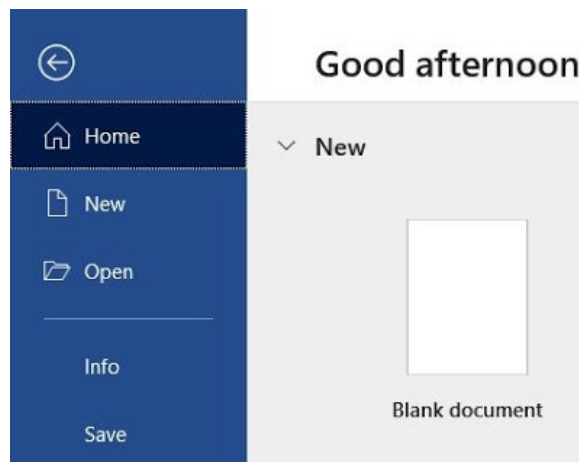
All the components of the QSL card (background picture, callsign, location, table about the QSO, and your picture) are in a sandwich - called working with layers. In plain English, that means you can move the components wherever you want, make them smaller, bigger or simply getting rid of them. Completing the QSO details in your final QSL card means just opening your Microsoft Word document, and entering the details inside the table, in dedicated boxes. We will get there...

- ♦ Start Microsoft Word. Create a new document. Save it with a meaningful name, something that you can remember and locate when you need it.

When you open Microsoft Word 2016 -2019 you will be presented with the following ribbon:



While it is not very clear in the above picture, this is what you see when opening Microsoft Word [click on the picture to enlarge it]. Choose "File" from the upper extreme left.

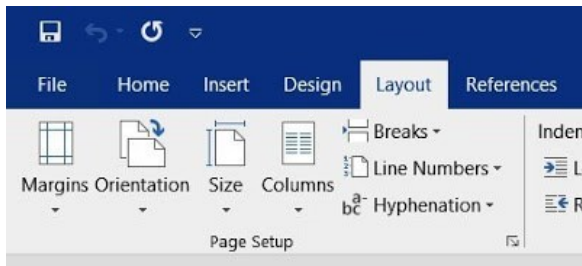


Double click "Blank document" and the screen will come back to the default display.

- ♦ Set the newly created document as a QSL card. That means it has to be a landscape document, of a certain size, with some specific margins (even zero, as in my case).



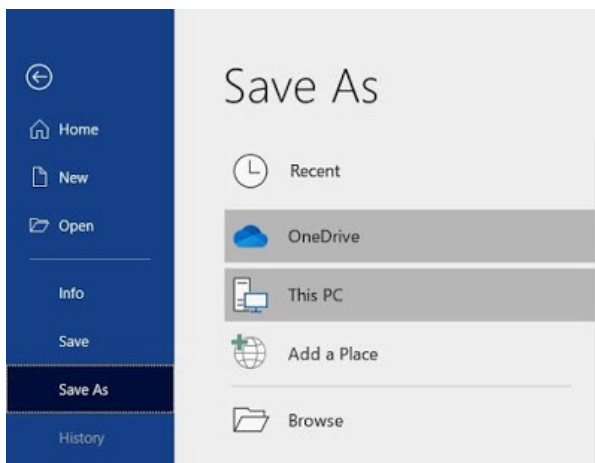
Click “layout” from the menu, or complete the above operations as your different word processor requires.



I put all margins to zero, and I take care not to put in any element at the extremities, except for the background. The orientation is landscape and a good size to format is 11 inches by 7.4 inches.

- ◆ Save the new document with a meaningful name, something that you can remember and can locate when you need it.

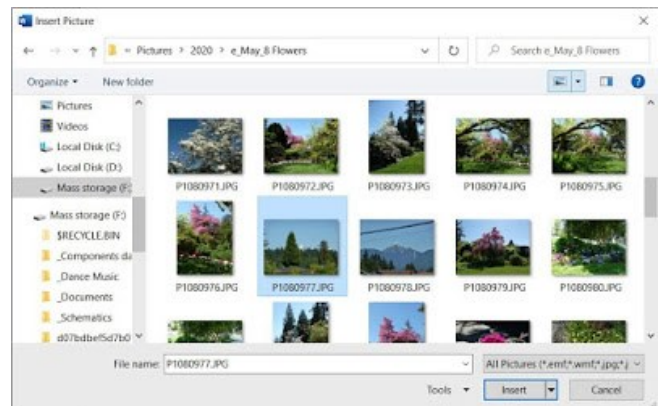
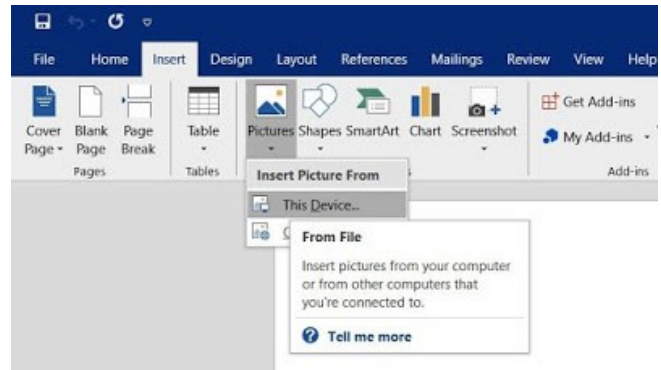
In the above picture, click “File” (upper left). From the new window click “Save As” and save it somewhere that is convenient for you. I saved it in the .docx format. It is OK to do it in the old .doc format, too, because we do not have any fancy or difficult elements for which we require the .docx format



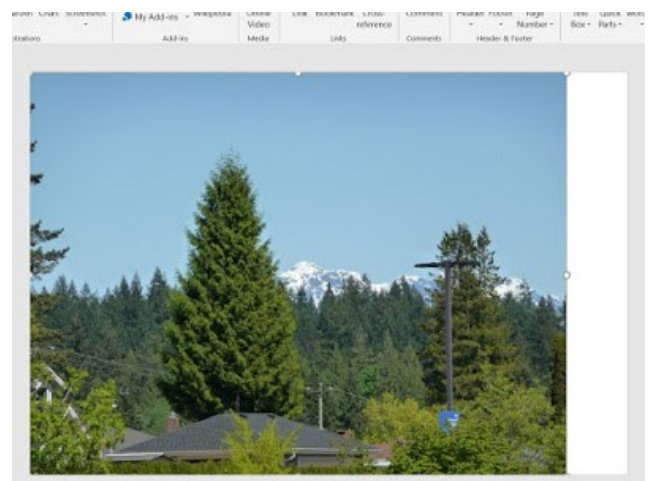
- ◆ Insert a background picture. Adjust its size and position.

I chose a picture that has good contrast, and allows me to put other components in the QSL card without obstructing the text. If you want to prepare the background in more detail, you should do it in a separate photo editing program. I never bothered with that much work, so I just introduced a picture as background.

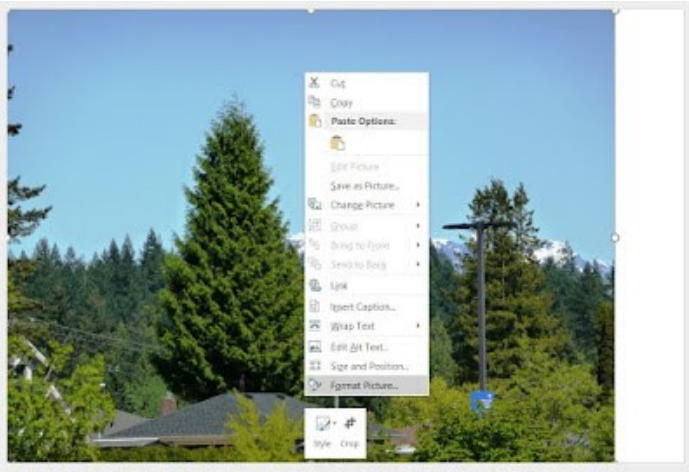
From the Microsoft Word ribbon choose “Insert” and then, from the drop down menu “Pictures”. My background picture for this tutorial is from my own computer, but it can be from an external hard disk or from an SD card, USB stick and so on.



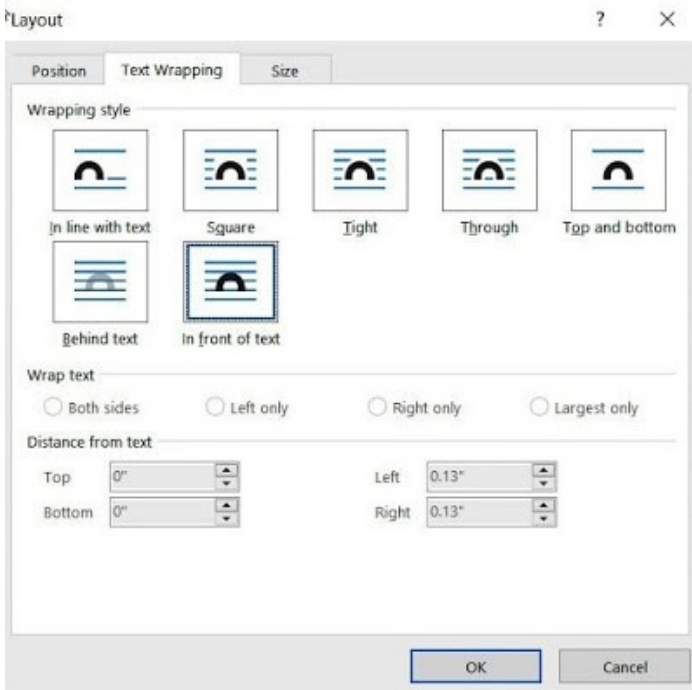
I have chosen a picture, and I click “Insert” (lower, right button). The result is not exactly what you probably expected, because the picture does not cover the whole background. I did not pre-process this picture:



I right click in the middle of the picture and from the drop-down menu I choose “Size and position” (just before the last one at the bottom).



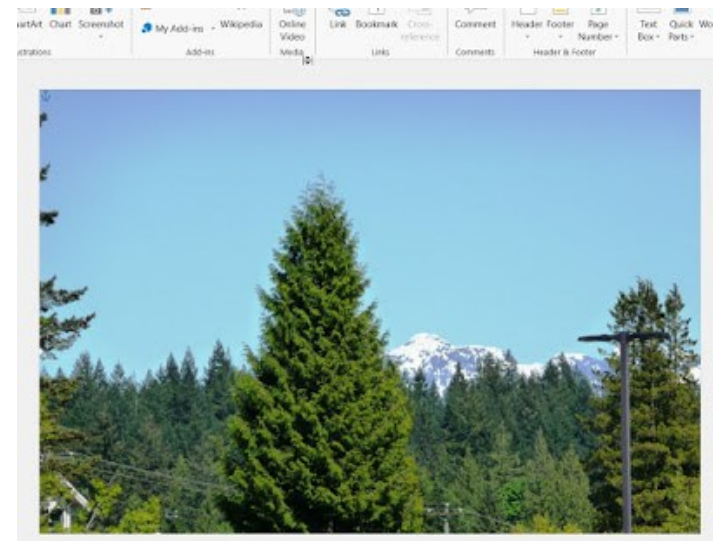
From the next dialog I have to choose “Text wrapping” and “In front of text”, and ‘OK’:



This allows me to freely move the background layer. I can magnify or reduce the picture used as background, and also move it around, to eventually use only the part of it that I want. If you left click the mouse in the

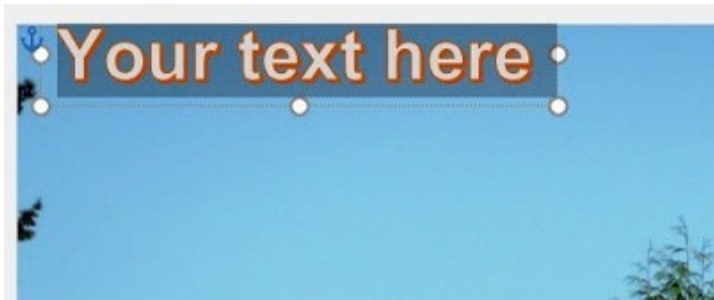
middle of the picture and keep it pressed you can drag and drop the picture. Keeping the left mouse button pressed it is possible to use the corner handles of the picture to increase it and decrease size, without changing the proportion. If you did something wrong use the “undo” button from your word processor, or CTRL and Z together from your keyboard.

I finally got to this:



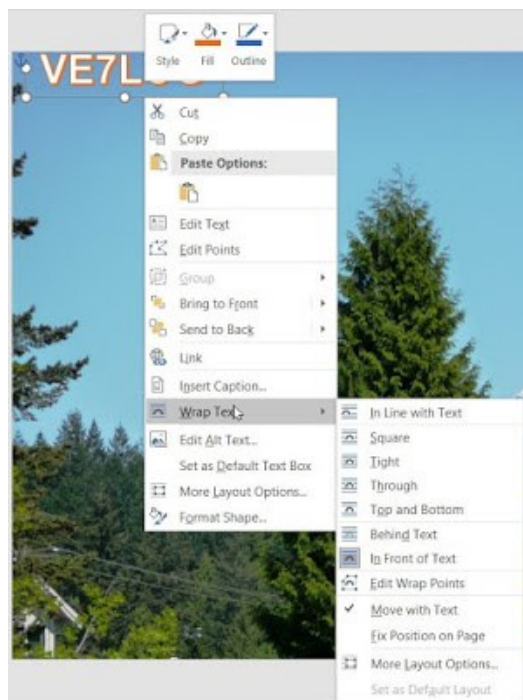
- ◆ Insert the callsign and follow the same steps described for the callsign in order to add any more text you want to the QSL card.

It is the high time to add the callsign. From the same “Insert” menu of the ribbon I chose “WordArt” and from the drop down choices I chose something that looked nice to me:

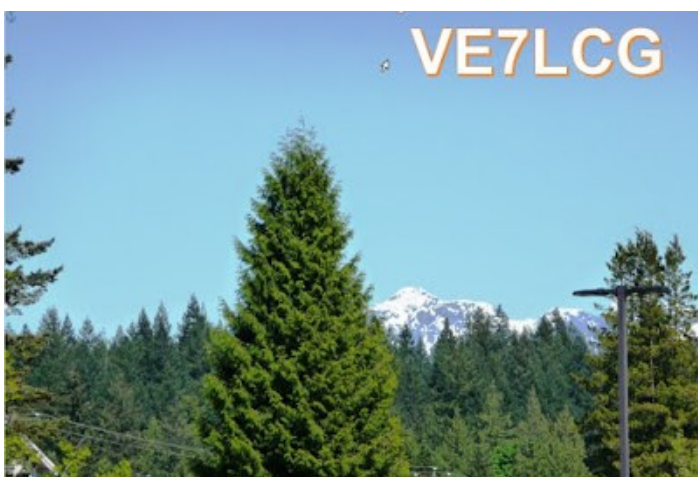


I have to go into the WordArt box to type. It is text like any other text from the word processor, so you can increase the font and so on with your normal tools in Microsoft Word or whatever alternative you use. In order

to move it freely, right click and choose “Wrap text” and “In front of Text”:



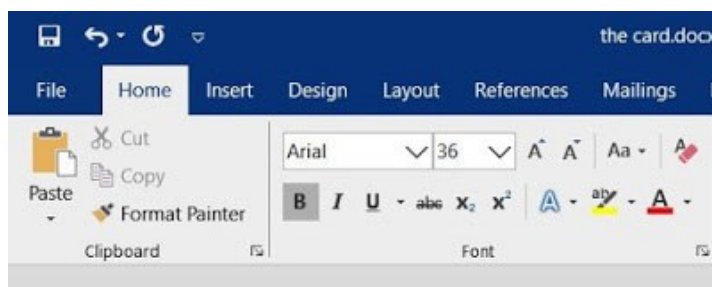
This allows me to move the callsign wherever I want. I select the callsign by putting the mouse somewhere at the outside extremities until I see a cross sign. Now I can left click, keeping the button pressed, and dragging the callsign to the position I want.



Often I click to select the callsign box but instead I select the background. I just UNDO and try again to catch the right element.

Following the same procedure as adding the callsign to the QSL card, I added my location, and placed it under the callsign. Use your creativity.

Do not forget to switch the ribbon from “Insert” to “Home” to increase or reduce the font size, its color and so on:



Your QSL card should now look something like this:

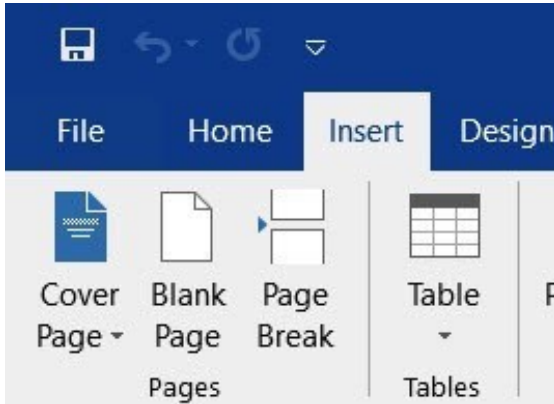


♦ Create a table to enter the QSO details.

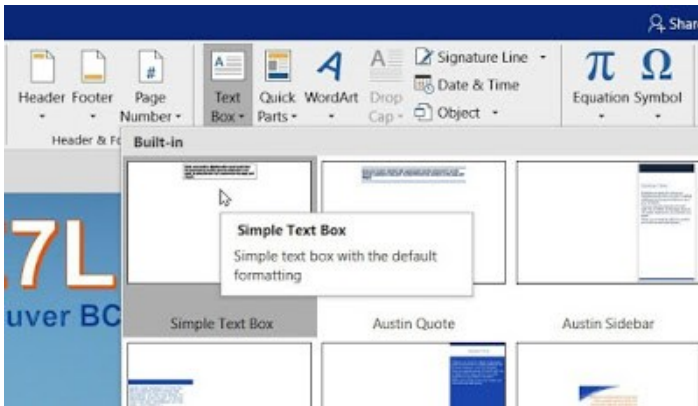
Perhaps other word processors allow you to directly insert a table into the document, but Microsoft Word 2016 - 2019 would not allow the insertion of such a table in the QSL card document we created. Not directly; we will first have to create a text box, and inside the text box we will be allowed to create the table.



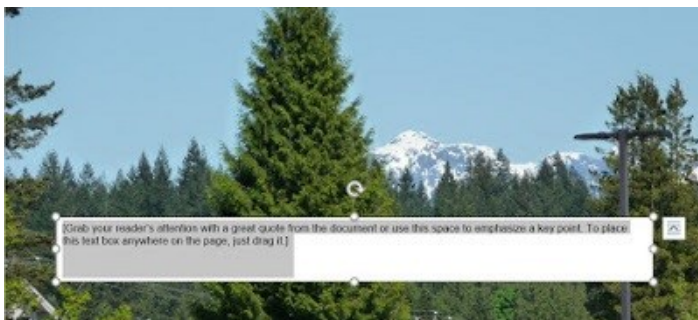
- ◆ We click the “Insert” tab on the ribbon:



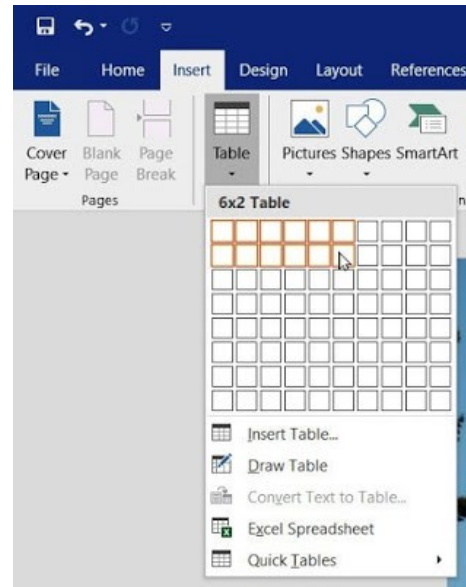
Now we click “Insert Text Box” from the right of the ribbon, and select a simple text box.



The text box can be dragged and resized. We can do this because it is created as “In front of text” by default. Otherwise we would have to right click on it and set it as “in front of text”. The box will be white, but in the end we will make it transparent. Select the sample text from inside the box and delete it.



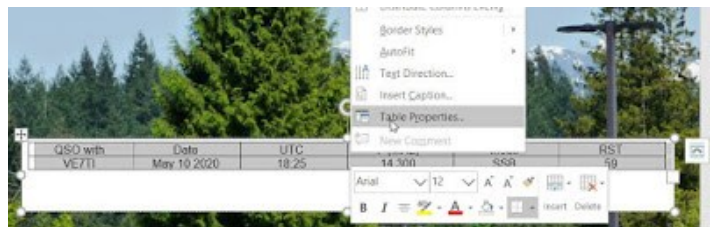
We will place a table inside the box, with 2 rows and 6 cells.



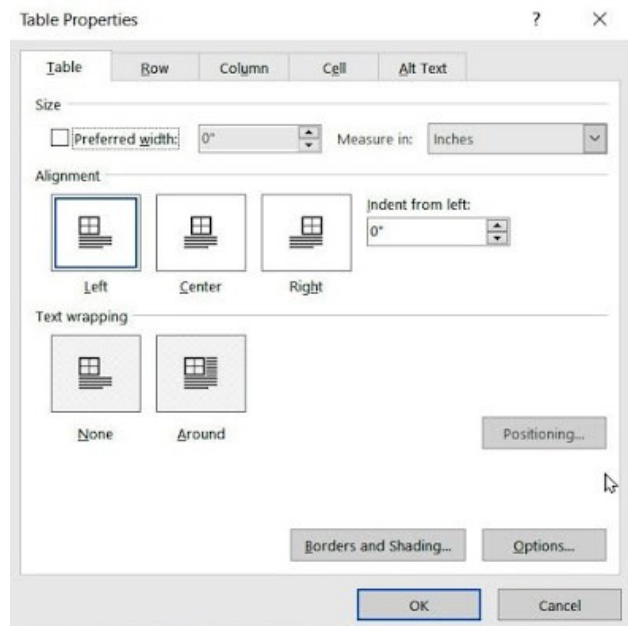
A table will appear inside the text box. If Microsoft Word does not let you do that it means the text box was no longer selected. Click inside the text box, and then insert the table. Type the headers and some example text into the table. Resize everything, and align the table and the text box in which the table exists however you want to.



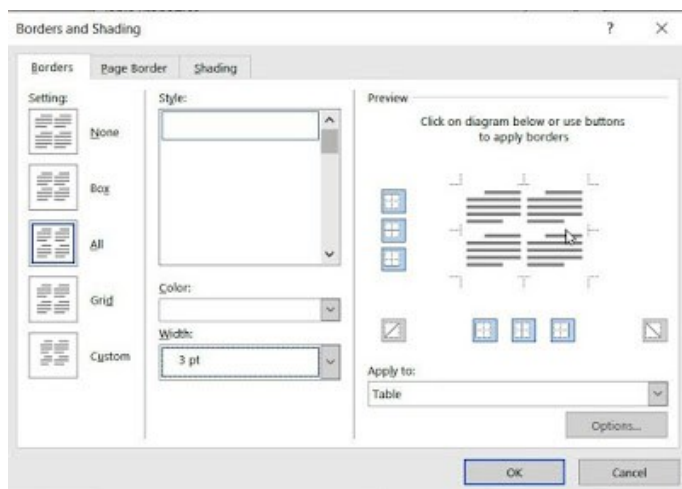
Eventually, you can declare the QSL card finished. I prefer to make some formatting touch-ups. Left click once inside the table. Right click on the table and select table properties:



Format your table as you want from in the next dialog box:



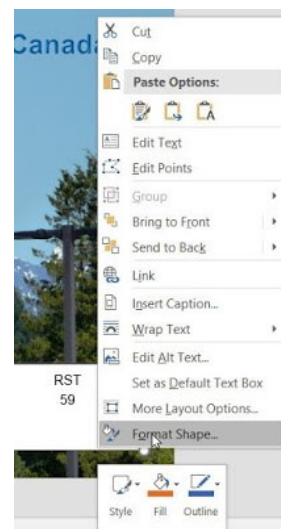
I especially play with “Borders and Shading” (lower left button). I make the border colour white, and the width 3 points:



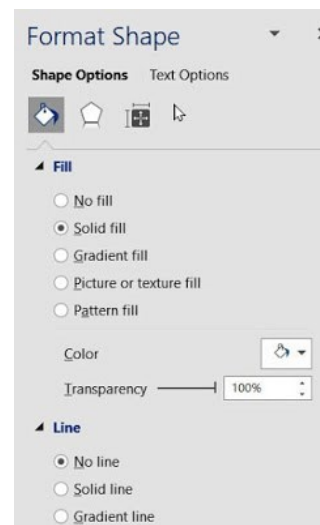
So, now the table is like this:

|                   |                     |              |                   |             |           |
|-------------------|---------------------|--------------|-------------------|-------------|-----------|
| QSO with<br>VE7TI | Date<br>May 10 2020 | UTC<br>18:25 | F (MHz)<br>14.300 | Mode<br>SSB | RST<br>59 |
|-------------------|---------------------|--------------|-------------------|-------------|-----------|

We should make the text box 100% transparent. Right click on it, and from the new dialog box select: “Format shape” (bottom):



On the right of the page you will have a new formatting box where you can move the slider for transparency to 100%. The box will disappear from our card (it is there, but it is transparent). We can also format the outside border to have no lines. Table borders are white, and the text inside is black, so not very visible. Let's select all the text and also make it white. (Because of the dark colour, it can be difficult to see if the text becomes selected or not; just select it - even if you are not sure you really selected it - and make it white. Most likely you succeeded.)





*Your finished card*

Following the same procedures described above, you can add pictures, text and so on. Just remember that Microsoft Word will likely freeze the new elements you inserted into layers of your card. You have to select the new element you just introduced, right click and choose "Wrap Text" "In front of the text". Our card is now finished, and we can save it.

- ♦ How do you use your new QSL card? Open the .docx document. Click inside the table, in the cells where you want to modify the text (another callsign for your contact, another date and so on). Save the document, preferably as a .PDF file, and send it.

In the next issue of The Communicator I will show you how you can print a batch of QSL cards and automatically enter the contact details from a spreadsheet.

~ Daniel Romila VE7LCG

## ***The 2020 'State of the Hobby' Survey***

This survey started out in 2017 as nothing more than simple curiosity. While browsing the Amateur Radio subreddit the author noticed several survey requests for highly specific topics. Yet often found himself wondering what the results were. It was then the State of the Hobby was born, acting to collect opinions on topics that impact amateur radio and those who participate. A critical goal of the survey is to make those results widely available for the entire community - and perhaps encourage operators to make changes in areas at issue, or continue doing what seems to be working! If these results bring even small changes, it was worth it.

This survey is important for a few reasons. First we need data independent from regulatory and commercial bodies about the topics that impact us. Second, this survey is a benchmark to help determine what is working and what is not in the ham radio community. This can involve participation, recruitment, mentoring and licensing. It can also help identify new and emerging trends in amateur radio. The 2020 survey is now closed and results are being tabulated.

[2017 Survey Results](#) | [2018 Survey Results](#)

[2019 Survey Results](#)



Daniel Romila VE7LCG

Daniel's  
Workbench

...continued



## The Temptation of Digital Ham Radio Modes

**Warning:** This story does not end well. Instead of reading this article you should consider doing some physical ham radio exercise, like in this YouTube video <https://www.youtube.com/watch?v=MQrIBMTzIM>

Several radio amateurs have desperately tried to attract me to ham radio digital modes. And, when I have participated in radio nets over repeaters, those experimenting with digital radio modes were portrayed as some kind of heroes. I've had good experience with Radio Data System (RDS) digital radio transmissions over FM myself, which allowed me to see the artist and the song name when listening to local FM radio stations, on radios I've built with Arduino and which have LCD screens:



I made the radios, I saw them in operation, but I never use them, because I listen to radio over the Internet. When I am outside, I am outside, and I keep my ears free for ambient sound and occasionally talking with people. I do not even carry a cellphone.

I started a practical approach. I looked in the RepeaterBook app (I run the Android application in an Android emulator called "NOX") and I found that I have a digital repeater 3.4 Km from me, VE7NWR which uses DMR [right].

I clicked on this 70 cm repeater, and what was written (confirmed by its website) did not look good:

Band : 70cm  
Receive : 444.60000  
Transmit : 449.60000  
Offset : +5.0 MHz  
Carrier  
DMR 1  
Heading : South West  
Distance : 3.4 km

IPSC Internet link to DCI-6 & DMR-MARC

In an effort to keep VE7NWR VHF clear for routine analog transmissions please keep all DMR to DMR QSO's to a minimum. BC 1 and BC 2 are best for local QSO's.  
See <http://www.nwarc.org> repeater page for additional talkgroup info.

So, they want me to use analog transmissions, and - if I still insist on digital - to keep it at minimum. Anyhow, I was looking for other digital repeaters near me, and I am lucky to have [right]:

One is Yaesu Fusion and the other is D-STAR. My immediate conclusion was that in a radius of 6.1 Km I do have digital repeaters, but each using a different standard.

|                                 |        |                 |
|---------------------------------|--------|-----------------|
| RepeaterBook<br>CNSRNF - 200 km |        |                 |
| 3.4 km, South West, DMR         | VE7NWR | 444.60000       |
| 4.2 km, South West, FM          | VE7NWR | 145.39000 100.0 |
| 4.6 km, South East, FM          | VA7ASI | 224.74000 110.9 |
| 4.7 km, North East, FM, IRLP    | VE7MFS |                 |

|                             |        |                 |
|-----------------------------|--------|-----------------|
| 5.5 km, South West, FM, YSF | VE7SKY | 444.97500 123.0 |
| 6.1 km, South East, D-STAR  | VA7ICM | 1247.00000      |

In a radius of 10 Km I have:

- DMR: 2 repeaters
- YSF: 4 repeaters
- WIRES: 1 repeater
- D-STAR: 1 repeater
- APCO25: 1 repeater



While I really wanted to be enthusiastic about digital modes, the fact that there are so many modes but that there is no single standard, did not look good. (But please keep reading because this problem was solved towards the end of the article).

Once I found that it makes sense to have digital radio equipment, I started to look for something affordable, something like a digital walkie-talkie. At a first look on the Chinese websites I found a Baofeng DM-5R Plus, dual band, DRM, dual time slot, tier I and II, for C\$64, shipping and taxes included [left].



The price for a mobile station jumps to C\$ 350, shipping and taxes included, for something like a Retevis RT90 [left].

Spending several hundred dollars for making digital radio connections with the 2 DRM repeaters I have nearby was not appealing. A solution to be able to use several standards would be a MMDVM (Multi-Mode Digital Voice Modem) hot-spot. I found something that supports DMR, P-25, D-STAR and System Fusion (Yaesu), built around a Raspberry Pi Zero, for C\$136, shipping and taxes included [left].



It requires an Internet connection, and eventually a digital walkie-talkie for connecting to this device, remotely. Somehow, going through the Internet defeats the concept of radio, but it is a compromise I would make. If the purpose were fixed, inside the home, and with a display, I would rather use a powerful full computer, with a big monitor.

I started to look for a USB device which could be connected to a normal Windows computer (usually they also work with Mac and with Linux). They are based on a chip called AMBE3000.



There are several manufacturers, and there are groups of radio amateurs that swear one product is much better than the others. I did not find any difference between them, since they are all based on the same chip. (They can be used for more digital modes than the pure software version, presented next.)

And once I went through all those hardware solutions, hardware and software solutions, the next logical step was to search for pure software solutions. This would have been the first step in my quest, but somehow I let myself be blinded by over enthusiastic radio amateurs, and not see the forest from the trees; so, it is something digital, and it is connected to the Internet, am I right?

I was lucky someone else did it for me (us). David, PA7LIM, a Dutch radio amateur, made a software MMDVM which for digital ham radio is something more than EchoLink is for analog ham radio. For the moment it can connect to DMR and D-STAR reflectors. Since the Yaesu Fusion vocoder is proprietary, I do not think it will have any future (I know a lot of guys would jump at my neck now for writing that). If you were to bet between D-STAR and DMR, I would bet on DMR. You know the saying: "If the standard is not a European standard, it does not exist".

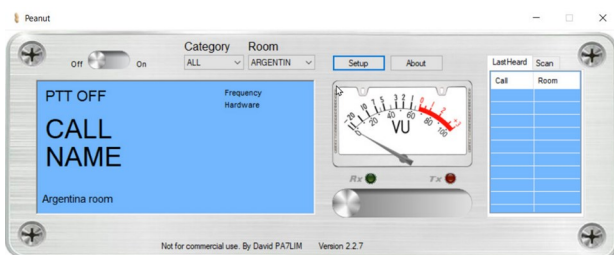


To be able to use the Peanut software, one has to already be registered with DMR and separately with D-STAR. Each one requires you to send a copy of your ham radio license. If you did not get to the step of sending your ham radio license you did something wrong, and this initially happened to me.

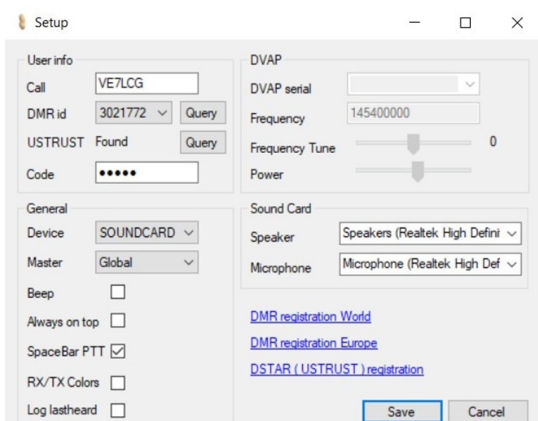
For DMR registration: <https://www.radioid.net/register#!>

For D-STAR registration: <https://regist.dstargateway.org/instructions/>

You also require a registration code from David PA7LIM, to freely use the software, and to insure only authorized hams use it. The software can be downloaded from: <https://www.pa7lim.nl/peanut/>. There are Windows and Android versions. I only tried the Windows version. I also installed the Android version in an emulator, and I saw that it looks exactly the same as the Windows version, so it would be redundant for the purpose of this article to play with both.



It is important to keep the button in the OFF position, to be able to click SETP and initially complete everything, for its first use:



Please complete as above, using your personal information.

It is a kind of EchoLink. But it has the advantage of having additional information, dashboards, which show digital users connected to the reflectors (only those reflectors/repeaters that Peanut can connect to, and there are so many of them):

You can see who is online via the peanut dashboard:

Global <http://peanut.pa7lim.nl>

Japan <http://peanut.xreflector-jp.org>

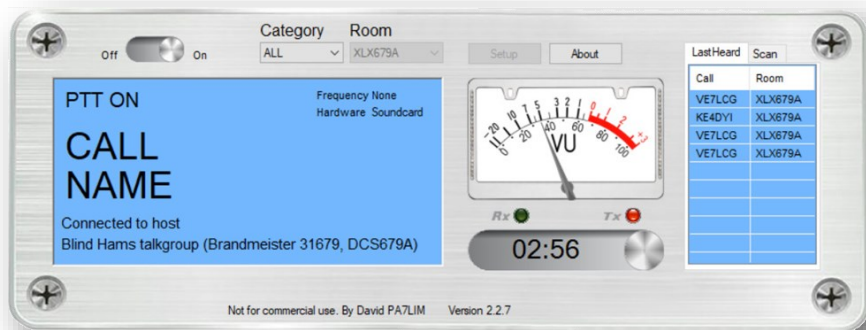
USA <http://peanut-usa.pa7lim.nl>

EchoLink was able to show only the users connected via Internet. I used the global Peanut dashboard. There is an annoying message window there, pushing for donations, but the windows from that page can be rearranged. I am interested in the “Last Heard” window and “Online users” window. (One can be online, but not heard, because he/she did not push the Tx button). I have two computer monitors. In one I have the Peanut dashboard, with the info windows I want:

| LastHeard       |          |          | Online users(218) |          |         |                 |
|-----------------|----------|----------|-------------------|----------|---------|-----------------|
| Search..        |          |          | Search..          |          |         |                 |
| Call            | Room     | Time     | Call              | Room     | App ver | Linked          |
| <u>LZ1PLC</u>   | YSF800   | 21:45:52 | KB3CAY            | XLX679A  | 1.59    | 21:45:40 - 19-6 |
| <u>A15OS</u>    | HBL27246 | 21:45:46 | MODWQ             | YSF-NWUK | 1.59    | 21:45:25 - 19-6 |
| <u>EA7JEO-R</u> | RE-SPAIN | 21:45:43 | DL5GL             | GERMAN   | 1.59    | 21:43:20 - 19-6 |
| <u>LU8AP</u>    | YSF-AR   | 21:45:43 | KS3X              | XRF295A  | 2.2.7   | 21:43:03 - 19-6 |
| <u>A15OS</u>    | HBL2351  | 21:45:43 | 3A2NH             | FRENCH   | 2.2.7   | 21:42:58 - 19-6 |
| <u>WD8JVO</u>   | USA      | 21:45:42 | KJ6ZKC            | XRF295A  | 1.59    | 21:41:30 - 19-6 |
| <u>LZ1PLC</u>   | YSF800   | 21:45:42 | CT2ITF            | XRF268E  | 1.59    | 21:40:27 - 19-6 |
| <u>LU2HLA</u>   | XLX190A  | 21:45:38 | F1SIR             | FRENCH   | 1.59    | 21:40:04 - 19-6 |
| <u>HB9DRX</u>   | XRF115A  | 21:45:36 | IU7LOB            | XRF706G  | 1.59    | 21:39:59 - 19-6 |
| <u>DJ2FR</u>    | XRF021B  | 21:45:32 | LU1YE             | YSF-AR   | 1.59    | 21:39:49 - 19-6 |
| <u>KI4HTA</u>   | HBL27246 | 21:45:24 | IZ4MUG            | XRF706G  | 1.59    | 21:39:12 - 19-6 |
| <u>TG5ALY</u>   | YSFSPAIN | 21:44:56 | WA1RHG            | USA      | 2.2.7   | 21:38:51 - 19-6 |
| <u>PT2AST</u>   | REF018B  | 21:44:51 | PY3WB             | XRF766D  | 1.59    | 21:37:37 - 19-6 |
| <u>DL1AAP</u>   | ECHOECHO | 21:44:51 | ON6CA             | HBL2351  | 2.2.1   | 21:36:21 - 19-6 |
| <u>IZ4MUG</u>   | XRF706G  | 21:44:51 | KN6FHL            | HBL27246 | 1.59    | 21:34:17 - 19-6 |
|                 |          |          | PU7MKI            | XLX888Z  | 1.61    | 21:32:55 - 19-6 |
|                 |          |          | F5JSQ             | FRENCH   | 2.2.7   | 21:31:18 - 19-6 |

I can hunt for a certain callsign, and after, connect in Peanut software in that room and call that station. Do not forget to switch ON, select “Category” ALL and after, select the room from the next drop-down menu. The switching between Rx and Tx can be done with the mouse, by sliding the button under the S-meter.





It is addictive. It is another form of EchoLink. The best sound is obtained between stations that are both directly connected into Peanut software and do not have any radio involved at all. The rest of the stations sounds so-so, from understandable to unusable.

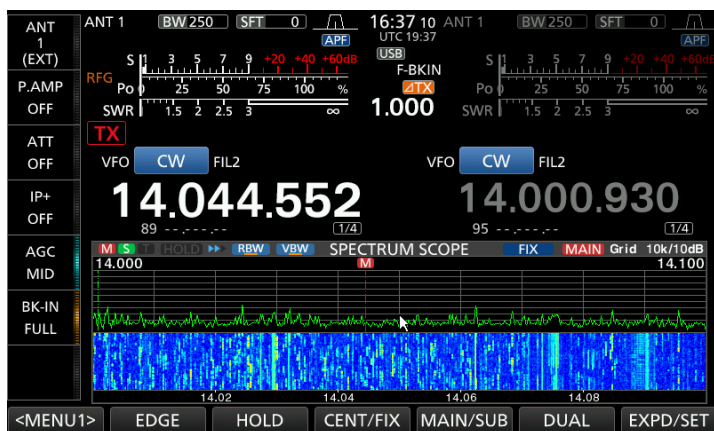
The result of my intrusion into digital ham radio modes resulted in yet another computer program using the Internet, which totally defeats the purpose of radio communications. Is it a good thing, or is it a bad thing? I do not know. It did not cost me a dime. I have another toy. I do not worry about any standards, and who will eventually win in the battle of standards.

From my experience, only people who lack a solid technical background are always enthusiastic about the new technical gadget in town. They must be, otherwise they risk being accused of not being technical enough. Those who really have a solid, unchallengeable technical background never cared about "amateurs" (LOL) and groupies (LOL).

It is a big temptation to sit on a chair and contact people from various parts of the world and practice various languages. The dashboard capability is a big plus in comparison with EchoLink. But I would like to come back to the warning at the beginning of this article and suggest that good physical exercise would perhaps be time better spent than infinite time on a chair making QSOs. Even the most specific ham radio activity, 'buy-the-garbage-sell-the-garbage', involves some physical activity and might be a better choice than hour after hour of QSOs.

~ Daniel VE7LCG

## What is wrong with this picture???



I am operating in the CW CQWPX contest today and just can't contact anyone. Yesterday all was good but today NOTHING at all. Have a look at the above picture and see if you can see what's wrong. It took me some time as I kept overlooking the obvious.

Answer page 90

~ Mike Weir, VE9KK

***Just be careful because people are going crazy  
from being in lock down!***

Actually I've just been talking about this with the microwave and toaster while drinking coffee and we all agreed that things are getting bad.

I didn't mention anything to the washing machine as she puts a different spin on everything. Certainly not to the fridge as he is acting cold and distant.

In the end the iron straightened me out as she said everything will be fine, no situation is too pressing.

The vacuum was very unsympathetic... told me to just suck it up, but the fan was more optimistic and hoped it would all soon blow over!

The toilet looked a bit flushed when I asked its opinion and didn't say anything but the door knob told me to get a grip.

The front door said I was unhinged and so the curtains told me to... yes, you guessed it... pull myself together.

(Anonymous)

*How am I doing?  
Well, I just wiped  
down the container  
of Lysol wipes with a  
Lysol wipe. So I'm  
fine.*

*Everything's fine.*



Hi John!

My name is Patrick Brown AK5TX Alaska to Texas! I just received a copy of your excellent newsletter. IT IS AWESOME! I ask to be added to your email list and receive your letter. Currently I teach Technician Class at our local library and always gathering tips, tricks, knowledge, and activities for our hobby, art, craft, sport, and science. Your letter is well presented and has great information. Since I am working on a newsletter also, you format is easy to read and see as I am legally blind. I do have questions and ask if in the future I can utilize you as a resource on these concerns? Keep up the great work!

73

Pat in Tyler Texas!

## Tech Topics

John H. Bryant, with Bill Bowers

### A Dummies Guide to Working with [old] Wal Warts

*This article, written in 2005, was forwarded with the suggestion that it may be suitable for use in The Communicator. Having read it, it applies to the older linear type, many of which are still in use. The majority I come across now are digital, using a switching power supply, and are frequently noisy RF interference sources.*

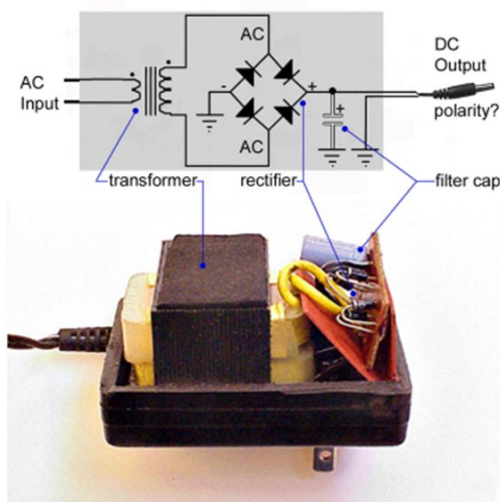
I've often been frustrated by my lack of understanding of the simplest electronic device that any of us possess: the ubiquitous "wall wart" plug-in power supply. I must confess that when I have co-authored technical articles in the past, the emphasis is very much on the "co." In such projects, I generally perform as scribe, editor, graphic artist and all-around cheerleader, while relying on my partner to supply the essential technical expertise and applied creativity. Thus, when faced with a

continuing need for small external power supplies of specific voltage or RF cleanliness, I have been at the mercy of the rather insanely high prices charged for such things at Radio Shack or other electronic parts outlets; all the while, I was accumulating a whole drawer full of spare wall warts, orphaned from various long-forgotten consumer and hobby devices.

In case you aren't familiar with the slang term "wall wart," that refers to the seemingly solid block brick that plugs into the AC mains electrical wall outlet and provides DC power to various consumer devices from cell phones through medium-sized radios to many computer peripherals. Typically, a good consumer-grade wall wart contains a transformer to reduce normal mains voltage to the range needed by the device to be powered. Once the mains AC power is lowered in voltage, it is run through a solid-state "bridge" (four diodes) or "full-wave" (two diodes) rectifier to be converted to DC. This is usually followed by a single filter capacitor. The power is then piped out through twin wires of appropriate size to carry the current at the designed power level. It is my understanding that some very inexpensive wall warts do not contain even rudimentary filter capacitors. Avoid these, if possible.

Being rather desperate for some small power supplies about a year ago, I finally worked up the courage to admit my ignorance about such things to long-time friend Bill Bowers. I asked him to develop some notes for me, so that I could create both adjustable and fixed voltage DC power supplies from my drawer of wall warts. This was about like asking a NASCAR driver to give you tips on parallel parking, but Bill kindly complied. In the last few months, I've loaned copies of these notes to several hobbyist friends, some of whom are technically astute and others, dummies like me. Both sets of folks have found Bill's notes very useful, so I am encouraged to share them more widely. What follows are Bill's notes, data and circuit diagrams (redrawn by me) along with my running commentary.

Typical "Wall Wart"





## Cautions

At its simplest, there are three possible outcomes to a project like this and two of them are BAD. When energized, there is some 120-volt AC (or more) electricity wandering around in what you are working on... Be careful, or you might fry yourself... or at least knock your heart out of rhythm. I hate it when that happens. BE CAREFUL! A second bad outcome is the possibility of frying the device that you are hoping to power with your newly modified wall wart. DC current has a positive and a negative leg and it is very easy to get them reversed (reversed polarity.) Often, this will literally fry the device that you hope to power. I take a very direct approach to checking for proper polarity at the end of one of these wall wart projects: I keep an unmodified wall wart around and I check its polarity first, using a small cheap analog volt meter. I pay close attention to which meter probe, red or black, that I use on the inner and outer parts of the DC connector and I note which direction the meter pointer swings. I then repeat the same test on my newly modified wall wart. That approach may seem both simple-minded and paranoid, but I've made too many sad mistakes to do otherwise. BE CAREFUL! The third possible outcome of one of these simple projects is VERY GOOD: you create a voltage-regulated, RF-clean, fixed or adjustable voltage DC power supply for about \$5.00 worth of parts and less than an hour of easy work. BE JOYOUS!

## Discussion

Most wall warts are manufactured to power a single small solid-state electronic device and are usually designed to supply DC power. This article focuses entirely on wall warts that supply DC. Unless the wall wart happens to be one of those few that also provides voltage regulation, the DC voltage measured at the DC tip of the device can be between 15 and 20 VDC, when there is no load on the wall wart. As load is applied to the circuit, the voltage drops proportionally. Thus, if a wall wart is rated at 12 VDC and 500 ma., the voltage will be significantly above 12 VDC when the supply is powering a device that only uses 200 or 300 milliamps of current. Similarly, the voltage will drop well below the specified 12 volts if more than 500 milliamps of current is needed by the device to be powered.

Cheap wall warts have a second weakness of concern to us: although they usually have a single filter capacitor inside the case, they are still somewhat dirty devices from an RF point of view and can produce all sorts of buzzing and other artifacts at the frequencies on which we normally DX. Most often, this is caused by "ripple" in the DC current created by the rectifier... Ripple is a less than smooth, steady value for the voltage and or current produced when plotted over time. It may be thought of and measured as vestigial AC current downstream from the

Originally, most AC/DC adapters were linear power supplies, containing a transformer to convert the mains electricity voltage to a lower voltage, a rectifier to convert it to pulsating DC, and a filter to smooth the pulsating waveform to DC, with residual ripple variations small enough to leave the powered device unaffected.

Size and weight of the device was largely determined by the transformer, which in turn was determined by the power output and mains frequency. Ratings over a few watts made the devices too large and heavy to be physically supported by a wall outlet. The output voltage of these adapters varied with load.

For equipment requiring a more stable voltage, linear voltage regulator circuitry was added. Losses in the transformer and the linear regulator were considerable; efficiency was relatively low, and significant power dissipated as heat even when not driving a load.

Early in the twenty-first century, switched-mode power supplies became almost ubiquitous for this purpose. Mains voltage is rectified to a high direct voltage driving a switching circuit, which contains a transformer operating at a high frequency and outputs direct current at the desired voltage. The high-frequency ripple is more easily filtered out than mains-frequency. The high frequency allows the transformer to be small, which reduces its losses; and the switching regulator can be much more efficient than a linear regulator. The result is a much more efficient, smaller, and lighter device. Safety is ensured, as in the older linear circuit, because a transformer still provides galvanic isolation.

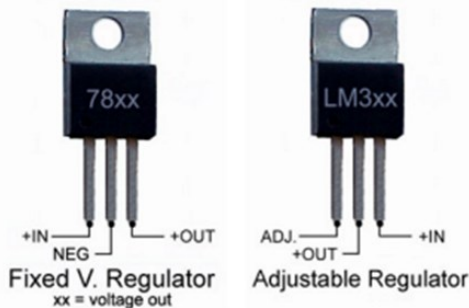
A linear circuit must be designed for a specific, narrow range of input voltages (e.g., 220-240 VAC) and must use a transformer appropriate for the frequency (usually 50 or 60 Hz), but a switched-mode supply can work efficiently over a very wide range of voltages and frequencies; a single 100-240 VAC unit will handle almost any mains supply in the world.

However, unless very carefully designed and using suitable components, switching adapters are more likely to fail than the older type, due in part to complex circuitry and the use of semiconductors. Unless designed well, these adapters may be easily damaged by overloads, even transient ones, which can come from lightning, brief mains overvoltage (sometimes caused by an incandescent light on the same power circuit failing), component degradation, etc. A very common mode of failure is due to the use of electrolytic capacitors whose equivalent series resistance increases with age.

rectifier and is often a cause of serious noise in RF-related circuits. Unless you are interested in DXing your new power supply and QSLing yourself, adding filter capacitors to your Wall Wart project is very worthwhile.

So, since we usually want to power an auxiliary device at a steady specified voltage and since we usually need a very clean power supply, what I wanted Bill's help on was in creating a filtered, regulated power DC supply. We accomplished this by adding a module between the wall wart and its DC output plug that contained a fixed or adjustable voltage regulator and a network of filter capacitors.

## Voltage Regulators



Bill recommended using two families of small integrated circuit voltage regulators for our more common applications: the 78xx family of fixed voltage regulators and the LM3xx family of adjustable regulators. Both of these families are popular in commercial and hobby applications and are manufactured in great

numbers; hence, they are all quite commonly available and very low cost. A grid of reference information for each family which follows:

### Fixed Regulators (2005)

Voltage IN must exceed voltage OUT by at least 3 volts under design load.

| Type  | I <sub>max</sub><br>amps | V <sub>out</sub><br>Volts | Package |
|-------|--------------------------|---------------------------|---------|
| 7805T | 1.0A                     | +5*                       | TO-220  |
| 7808T | 1.0A                     | +8*                       | TO-220  |
| 7809T | 1.0A                     | +9*                       | TO-220  |
| 7812T | 1.0A                     | +12*                      | TO-220  |
| 7815T | 1.0A                     | +15*                      | TO-220  |

### Adjustable Regulators (2005)

Voltage IN must exceed voltage OUT by at least 3 volts under design load.

| Type    | I <sub>max</sub><br>Amps | DC <sub>out</sub><br>V <sub>range</sub> | Package |
|---------|--------------------------|-----------------------------------------|---------|
| LM317LZ | 0.1A                     | 1.2→37*                                 | TO-92   |
| LM317T  | 1.5A                     | 1.2→37*                                 | TO-220  |
| LM338T  | 5.0A                     | 1.2→32*                                 | TO-220  |
| LM350T  | 3.0A                     | 1.2→32*                                 | TO-220  |

## Filtering

Most electronic devices have some kind of filtering, usually accomplished with multiple capacitors, to remove 60 and 120 cycle ripples from the DC electrical current powering them. Most wall warts do contain filtering, but it is usually far less than adequate for our purposes, either because the device that the wall wart was designed to power did not require filtered power or because the majority of the filtering for the original device was done inside the device itself.

In these kinds of circuits, it is good practice to place filter capacitors both before and after the regulator. Bill suggests using 470µf electrolytic caps that are rated at 50 volts for this application. These are commonly used in computers and many other low voltage circuits and are often "almost free" when bought in bulk. In Bill's two suggested circuits, these are twinned (paralleled) with .1µf caps and, in critical RF circuits, they are followed by a .001µ cap, as well. If possible, Bill also recommends placing a small (.1µ or .01µf) capacitor between the positive bus and ground, just inside the box of the device to be powered. This will ground any stray RF that might be picked up by the DC lead running from the regulator circuit to the circuit to be powered.

When I was building the first of my circuits, I found that the only small 50 volt electrolytics in my junk box were 100 µf units, far smaller than the suggested 470 µf caps. I talked to Bill and he felt that the 100µf units would likely suffice. They did, in that particular application. However, I now routinely use the suggested 470µf caps for general applications. As I understand it, there is almost no such thing as too much filtering.

On the next page are two typical circuits, one for fixed voltage, the other a circuit for variable voltage.

For R2, I prefer to use a small screw-adjustable trimmer resistor by Bournes. This particular design is screw-adjustable from the top and, as with all Bournes pots, is veerry smooth. From Mouser, the part number is 652-3296Y-1-502.

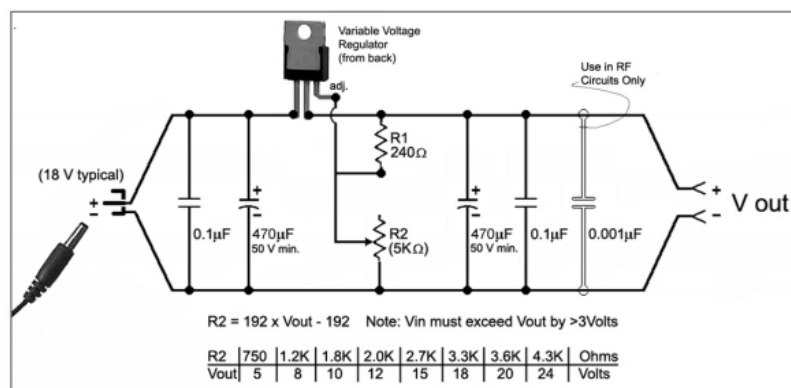
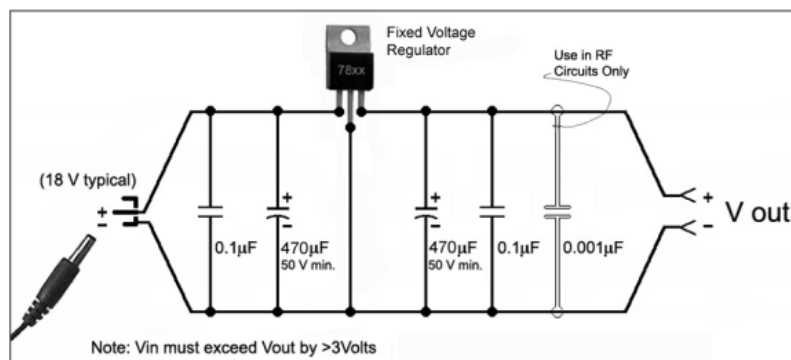
Some hobbyists may feel that the filtering network suggested in both of the above circuits is a bit excessive. For some applications, that is undoubtedly true. However, given the critical nature of some of our circuits and the disastrous affects that 60/120 cycle buzz can have on weak signal DXing, I tend to err on the conservative side. After all, the component costs of this design are literally pennies apiece, so more filtering is generally better.

### Selecting An Appropriate Linear Wal Wart

Using wall warts as a basis for power supplies should, for all sorts of reasons including fire safety, be limited to supplying devices that need no more than .100 to .150 amperes of current at the specified voltage. If your device requires more current than that, we strongly recommend either buying or building a complete regulated power supply. Thanks to modern components, these are relatively simple devices, with designs, components and complete supplies being readily available.

Within the range of regulated supplies requiring 100 to 150 milliamperes or less, the primary concern in selecting a wall wart is to make sure that it will supply power at least 3 volts DC in excess of the desired final controlled voltage, when the circuit is running at the designed load. This “3 volts in excess” comes from the basic needs of the voltage regulator itself. The most straight-forward approach to selecting a wall wart for your project would be to select one with an amperage rating that matches your needs and a voltage rating that is 3 or 4 volts higher. Thus, if you need a 5 VDC, 100 ma. regulated supply, you might select a used “9 VDC” wall wart rated at 100 or 150 ma. If you need a 9 volt regulated supply at 70 ma., you might select a small “12 VDC” wall wart rated at 100 ma.

The selection becomes a bit more complex, if you desire a 12 volt regulated supply. One way to go is, as discussed above, to use a 14,15 or 16 VDC wall wart rated at least as large as your design load in milliamperes. However, these wall warts though less common are readily available from JAMECO and other supply houses. The other design strategy for building a small, filtered and regulated 12 VDC supply is to take advantage of



the unregulated nature of wall warts. Remember that a wall wart rated at 12 VDC and 300 ma., will actually supply significantly more than 12 VDC at loads smaller than its rated load in milliamperes. So, if you need a regulated 12 VDC at 150 ma., a wall wart that is rated 12 VDC at 300 ma. would likely supply at least the requisite 15 volts to your new regulator at the 150 ma. load level. The only way to be sure is to measure the voltage output under the load you expect to use.

Some published diagrams of wall warts show a fuse in the circuit. None of the units that we cut open had fuses. If your application requires a fuse, you'd better incorporate it in the same box with the regulator and capacitors. It was also noted in all the wall warts that were opened they all did contain a filter capacitor but it varied from 50 to 1000 uf, with most containing a 100 uf capacitor. Unless you plan to cut open your wall wart, then adding the suggested capacitors looks like a good idea.



### Heat dissipation

Like most devices dealing with power, voltage regulation tends to create heat. In our case, the more reduction in voltage accomplished by our regulator and the higher the current, the warmer the regulator gets. At loads around 100 ma. and dropping the voltage only 3 volts, the heat generated is only .3 watts. However, the amount of heat generated builds up rather quickly as one moves to higher currents or deeper voltage drops. Happily, all general electronics houses stock small heat sinks designed specifically to snap 6 on the body of our “TO-220” shaped regulator. Since they only cost between US\$0.15 and \$0.30 each, we strongly suggest snapping one of these devices on the regulator, no matter what the projected current draw. Further, knowing that heat generation/dissipation is a concern with power supplies, common sense would dictate normally using a metal box and making sure to provide cross-ventilation by drilling a few holes in the case.

John, being a “hands-on” type, does not put his regulation/filtering modules into a case until after he hooks the entire circuit up to the device needing power and lets it run for a while. If the regulator and its little heat sink get warm, it is relatively easy to use common sense to determine what kind of enclosure and ventilation strategy, if any, is needed. This kind of careful in-use testing of your newly modified wall warts is strongly recommended.

Bill ran a series of measurements on two wall warts to demonstrate the effects of the new regulation/filtering module. Both sets of measurements used a variable voltage module that I assembled from Bill’s second schematic. That particular module is also the one used in the photo illustrations at the end of this article. Two wall warts were tested. Each wall wart was tested from 0 ma. to its rated current capacity. The output voltage, VDC, and ripple voltage, VAC, were measured with a Fluke-45 Dual Display Voltmeter. The “Regulated” values were obtained using the new filter/ regulator circuit.

|     | Unregulated |     | Regulated |     |
|-----|-------------|-----|-----------|-----|
|     | VDC         | VAC | VDC       | VAC |
| I   | Volts       | mv. | Volts     | mv. |
| ma. |             |     |           |     |
| 0   | 17.3        | 0.5 | 9.1       | 0.5 |
| 50  | 15.4        | 45  | 9.0       | 0.5 |
| 100 | 14.6        | 84  | 9.0       | 0.5 |
| 150 | 13.9        | 121 | 9.0       | 0.5 |
| 200 | 13.4        | 151 | 9.0       | 0.5 |
| 250 | 13.2        | 191 | 9.0       | 0.5 |
| 300 | 12.6        | 229 | 9.0       | 0.5 |

WW#1: 12 VDC / 300 ma / Bridge rectifier circuit / 2000 uf filter condenser

|     | Unregulated |      | Regulated |     |
|-----|-------------|------|-----------|-----|
|     | VDC         | VAC  | VDC       | VAC |
| I   | Volts       | mv   | Volts     | mv  |
| ma. |             |      |           |     |
| 0   | 28.8        | 1.1  | 12.1      | 0.5 |
| 50  | 24.8        | 430  | 12.0      | 0.5 |
| 100 | 23.1        | 680  | 12.0      | 0.5 |
| 150 | 21.4        | 950  | 12.0      | 0.5 |
| 200 | 19.8        | 1260 | 12.1      | 0.6 |

WW#2: 18 VDC / 200 ma / Full wave rectifier circuit/ 220 uf filter condenser

Looking at the Unregulated VDC column in both grids, you can see the very unregulated nature of most wall warts, with the maximum voltage (minimum load) on each over 75% above the rated voltage. Comparing the Unregulated Voltage to the Regulated Voltage of each unit certainly illustrates the effectiveness of our voltage regulator. The Unregulated VAC (the “ripple voltage”) columns of each are quite interesting. When comparing the two, you can see the effects of the more efficient bridge rectifier in WW#1 and its much larger than usual single filter capacitor. It is likely, though, that the remaining 200 or so millivolts of AC would induce a 60/120 cycle storm in our more critical uses. The 1260 millivolt ripple in WW#2 is probable more typical (and scary!) As you can

see, the new filter circuit only allows one-half of one-thousandth of a volt of AC ripple to pass through our circuit. Finest kind!

Recently, I've used Bill's first circuit to made up several fixed voltage supplies for various uses. However, as a normal procedure, I plan to prefabricate generic adjustable units rather than fixed voltage, single-use units. My approach is to order parts for five of the adjustable modules at once and build them all, as a group, on small pieces of 1" x 2" perf board. Then, when I need one, I'll drop it in the box, attach the wall wart and set the voltage with a digital multimeter. Fifteen minutes work and I'm ready to roll.

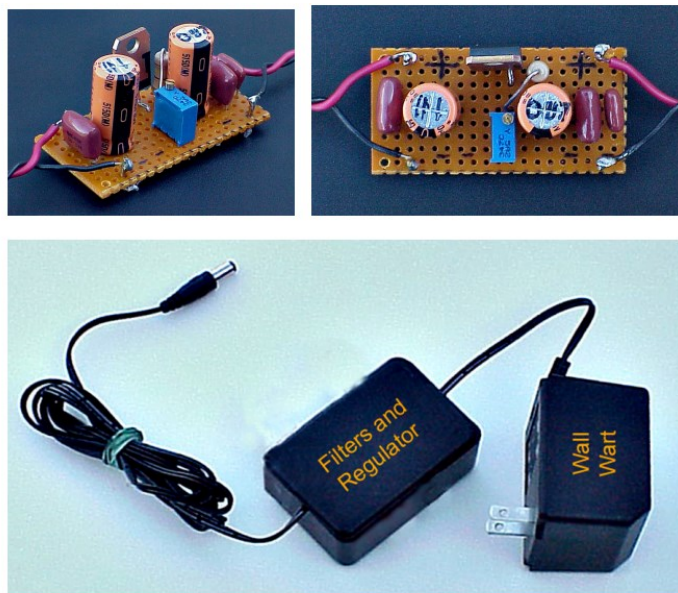
### Other Uses

If you have managed to read this far, you have almost certainly realized that these two circuits have uses far beyond harnessing the power of wall warts. For most of my own career as a MW and SWBC DXer, I've DXed almost as much from a vehicle ("12 volt DXing") as I have from a formal radio shack. These circuits are just the thing, of course, to convert the power from one or two deep-cycle batteries to the various lower voltages required by some pieces of peripheral DXing equipment.

Another good article is located at:

<https://sites.google.com/a/clever4hire.com/special-articles/home/ac-dc-power-supplies---using-wall-warts>

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Can You Hear Me Now?

### Ode to The Communicator

*I sit on a chair  
When launching CQ  
And sometimes I dare  
To think about you.*

*You are my antenna  
Connecting the wave  
Eternal dilemma  
Of radio crave.*

*Reading the pages  
Again and again  
I always need ages  
To all understand.*

~ Daniel, VE7LGG



# VE7SL's Radio Notebook

## 6 Meters—Part 1: The 'Magic' Band Then

Steve McDonald VE7SL

*Those of you with only Basic qualification here in Canada are often at a loss at how to work some more exciting bands. Summer is the season for 6 meters and, even with Basic, you are qualified to operate in the 50 MHz band. Antennas are not large and they are easy to make. Give it a try... you may be surprised. Here is the first of two installments—Ed.*

And so the magic starts... long ago... on a hot July afternoon back in 1938, as Harry W6DNS, returns from work to his hillside home in San Diego. Before taking a short pre-dinner nap, Harry tunes across "five" and hears the usual hiss of a dead band. Wakening for dinner, he checks the band once again. Dinner will have to wait tonight. The band is full of signals... more than Harry has ever heard before! He later reports to RADIO magazine, "What a shock I got! The band sounded more like "ten" than "five". W1's, 2's, 3's, 5's, 6's, 7's, 8's and 9's were coming through. The QRM was terrific..."

Twenty-five hundred miles to the east, Nat W1EYM, in Connecticut, is also carefully tuning "five", hearing mostly stations from the central states and the Great Lakes area. Digging a little deeper he is shocked to hear the S7 phone signal of W6DNS in QSO with a W7! Nat anxiously waits for the two stations to sign before calling the Californian and then holds his breath... he knows that, should he hear a reply, things will never be quite the same on "five" again.

"W1EYM this is W6DNS in California!" is heard through the QRM and at 1810 PDST the first confirmed trans-continental

double-hop QSO on the "ultra highs" forever becomes part of history.

Up until this point, "five" had always been regarded as unpredictable with 'quirky' propagation. Amateurs had discovered that for some reason, the summer months would provide sporadic openings out to 800-1000 miles. There had been rumors of W1's hearing W6's and even reports of trans-Atlantic and trans-Pacific receptions... but always unconfirmed and often dismissed as "wishful thinking" or "bootleg" operators. But there was no mistaking what had happened on July 24, 1938!

Eventually amateurs would trade "five" for what would become known as today's "magic band"... but I think Harry and Nat had already discovered the magic, back on that warm summer evening so long ago.

### 6m From Western Canada

Six meters has been my favorite band for over thirty-five years. I first got on 'six' back in the early 70's using a homebrew FET 'Handbook' converter and a homebrew 6360 transverter at 8W output. I was hooked from the beginning, managing to work 32 states during that first summer on six. I learned very early that openings could easily be predicted by knowing when you were leaving the house, as it seemed (and still does!) that the band is always open when you are not at home. Part of the challenge of six is just being able to be there when the band is open!

PROPAGATION - on six from southern VE7 land is probably about the poorest in



*W6DNS - Harry Hasenback of San Diego, CA. Harry used a National NC 1-10 super-regen receiver along with a homebrew HK54 parallel line grid circuit oscillator driving a pair of HK54s at 175W input. The power supply and transmitting gear were all located on the roof in a plywood box in order to reduce feedline losses. His antenna for the milestone QSO was a vertical collinear array consisting of 3 half-wave elements with directors on a 50' mast.*

*(QST Sept 1938)*



North America, with the exception of points to the north (Alaska, northern BC, VE8). The major propagation mode on six is during the summer months and is via "SPORADIC-E" or "Es". Starting about mid-May through to mid-August, peaking around early July, the band can open at any time via this fascinating mode. Typically, Es will peak in the morning and in the late afternoon and evening hours. From south-west B.C., most Es openings are single-hop, and favor the south-western states from California to Colorado. Several times each summer, openings will extend out to the eastern states, eastern Canada and down to the southern states. There always seems to be at least one or two openings via multi-hop Es into the Caribbean each summer but these are usually in the morning and short-lived.

These unpredictable openings are part of what makes six so interesting. Often, signals via Es will reach bone-crushing strength. Often the band will open in an instant, as if a switch has suddenly been thrown into the 'on' position. Listening on the calling frequency (50.125), I have often heard stations suddenly appear in mid-sentence, as the band suddenly pops open for the evening! Since the main generator of Es is now thought to be related to high-speed wind shears, this 'sudden' open band concept is easier to understand.

F2 - the real workhorse mode of the HF bands is much rarer on the magic band. Only during peak years of the solar cycle is six meters likely to support

propagation via the F layer. We have been fortunate in that the last three cycles have been 'big' ones and have generated sufficiently high levels of solar flux to open six via the F layer. On the other hand, Cycle 20, peaking in the late 60s, was a very poor performer and only one QSO via F2 from western Canada is known to have taken place, when VE7XF worked several KH6s in March 1969 following a strong auroral event the previous day. During the peak solar years of strong cycles, with sustained flux levels in the low to mid 200s, one should start watching for F2 openings starting in late October through to late March. Typical openings from VE7 land will begin towards VE1/W1 and progress from there, following the daylight. Normally the band will slowly shift towards the Caribbean and Central/South America and then out to the Pacific and Japan. On rare occasions, morning openings will take a more northerly direction providing a very rare polar path, while afternoon openings might dip more southerly towards New Zealand and Australia. There is only one certainty... you just never know what the band might do!

One of the most fascinating activities associated with 'solar high' winters is to watch the 'maximum usable frequency' or 'm.u.f.' rise from 10m to 6m by slowly following all of the commercial FM activity in the 30-50MHz range. Paramedics, fire crews and police services can be easily heard, often with sirens blazing in the background, as the m.u.f. climbs towards 6m. New York or Boston accents will usually indicate that six will

open to the east coast on the northerly path, while southern drawls should alert you to possible Caribbean signals about to reach 6m. Each morning will be different, with the m.u.f. rising slowly over one to two hours while other mornings it will shoot up like a rocket in a matter of one or two minutes. More often than not, the m.u.f. will climb to 47 or 48MHz and stop, then slowly drop... no 6m DX on those days!

### ***Magic or Not? - You Decide...***

During Cycle 21, I operated 6m from a suburb about 25 miles N-E of Vancouver. My station consisted of a little Yaesu FT-620 transceiver (10W) driving a homebrew 5894 amplifier at about 100W output. My antenna was also homebrew - a 5 element 'W1HDQ' yagi on a 12' boom at 55'. There were many



*W1EYM - Nathaniel Bishop of Fairfield, CT. His carefully assembled station consisted of a homebrew acorn tube converter feeding a Hammarlund Super Pro for receiving while the transmitter used the newly introduced 6L6 to drive a pair of 6L6's in the final. Nat also used a vertical array fed with a Johnson 'Q' match.*

*(QST Sept 1938)*

'magic moments' during Cycle 21, as it was my first exposure to F layer propagation on six.

One of the more interesting contacts of Cycle 21 was on November 10, 1981. The band had opened to JA in the afternoon and I had worked a number of JA's until the band closed at around 1600 local time. Needing to do a little repair work on the antenna changeover relay on my amplifier, I decided that it was safe to take the amplifier apart, repair it, and be ready for anything that might happen the next day. I disconnected the amplifier and started the repair work, having plugged the antenna into the transceiver to monitor the calling frequency (50.110 in those days). At around 1715 I went upstairs for dinner but no sooner had I arrived upstairs when I heard an SSB signal on the calling frequency. Knowing that the band was 'dead', I ignored it until I heard it a few more times, coming from the basement shack. Going back to the shack, I was shocked to hear VS5DX in Brunei calling CQ! With my amplifier torn apart on the bench, my heart sank as I realized that my 10W transceiver would never be enough to make the QSO... but wait... wasn't this the magic band? Somehow my lowly ten watts found its way to Brunei with no problem (7300+ miles) and VS5DX was worked at

1730 local time, over forty minutes after the November sunset.

One of the most exciting days ever, occurred on June 10, 2001, in the middle of the ARRL summer VHF contest. The band had been very quiet with little activity other than locals and the odd signal on scatter from the south. At around 1030 local time, Ralph (VE7XF), had been listening to K7RAT on CW tropo-scatter when he heard the Oregonian calling a European! Listening closer, it became apparent that Tree was running Europeans. Ralph quickly alerted myself and Jason (VE7AG) on two meters and all of us swung our beams towards Europe...and waited hopefully. About fifteen minutes later, ON4GG's 599 signal appeared out of nowhere and was quickly worked. This was not only my first European QSO on 6m but also the first ever "VE7-Europe" contact made on 50MHz since the band was established in 1946. Both Jason, Ralph and Gabor (VE7DXG) also hit pay-dirt that morning as we all worked a number of Europeans before the magic stopped, just a few minutes later!

A memorable day from Cycle 23 was January 4th, 2002. The 'normal' opening to the east coast had failed to appear that day. Apparently what had really happened was that the skip was longer than 'normal' as the first signal to appear was around 1015 in the morning. It was EH8BPX in the Canary Islands! I had only heard Africa once before (in Cycle 21) and had failed to work it. I was determined not to let my next chance of completing W.A.C. on 6m slip away! As it turned out, I needn't have worried... the signal from Africa steadily got stronger and stronger and was in for well over an hour. Several other locals

were fortunate enough to be around that morning as well to catch a very, very rare opening from VE7 to Africa on six.

Nothing was heard again until around 1330 local time when I began to hear the OX3 beacon from Greenland. A short CQ on 50.110 brought a thundering reply from OX3OX, running 100W to a dipole! Ole kept CQing for another fifteen minutes with no replies as apparently all of the locals had abandoned the band. For the next ninety minutes I periodically keyed up on .110 and asked, "Are you still there Ole?" and always got a response, as he was quite content to just monitor on .110 while doing other things in the shack. It was truly an interesting day on the magic band.

Working Aurora on "six" is usually fairly predictable. With the beam pointed to the northern auroral zone, the geometry is such that signals from Washington, Oregon and Idaho are usually dominant. Occasionally, signals from further east such as VE5 and WØ will make it here as well. On the night of October 28th, 2000, as Cycle 23 was ramping up, the 'normal' aurora became something very different.

I had been listening to auroral CW signals from Washington and Alberta, with the occasional peep from VE5 when I heard something that sounded too strange to be true... a VK4 calling CQ! I quickly turned my beam towards Australia and listened intently but heard nothing. Bringing the beam back to the north produced the VK4 once again, with a pure auroral "buzz" on his signal. Evidently the signal from down-under was propagating across the Pacific (still in daylight) via the F layer and arriving at just the right angle to reflect from the auroral



curtain in northern BC or Alaska, as the signal peaked towards the N-W. Over the next hour, four VK4s were worked on CW, all with the beam pointed towards Alaska! They also reported that my signal had the tell-tale "buzz" of aurora. True to the words of Robert W. Service, "The Northern Lights have seen queer sights...", both the aurora and the magic were working overtime that night.

October 15, 2000 was another day that "six" chose to demonstrate its mysterious charms. A solar flare the day before had put most ops on high alert for anything unusual. There had been little activity on the band since mid September. At around 0850 local, PYØFF on Fernando de Noronha was heard and worked with weak signals both ways. No other signals were heard before or after his sudden appearance. The band remained quiet until a little after 1000 when LU5VV in southern Argentina made an equally sudden appearance. Located in grid square FE48 (a little over 7000 miles away) his signal was exceptionally strong, peaking 30-40 db over S9... almost as if he were in the next block. He explained to me that he had blown the final transistor in his transceiver and had to make a substitution with the only suitable one in his junk box. He was putting out about 8 watts. Pure magic !

Operating on 6m since the early 70's, I had pretty well thought that there weren't

too many more surprises left in the band that I hadn't already run into... until the morning of July 10, 2009 when once again the magic would appear. Very early in the morning I had been talking with Jack, OA4TT, on the 6m internet chat page. Jack was located about 110 miles south of Lima, Peru, and a little over 5000 miles south east of me. I had jokingly said that in order to work we would need at last four good "hops". One down to Utah / New Mexico, another into central Mexico, a third over the Pacific Ocean and a fourth down to Lima. I had never worked into South America on summer Es before and I'm sure Jack had never worked into VE7 as well. Since the band was dead, I left the shack a few minutes later without giving the idea much further thought. Around two hours later (almost 1000 hours local time) I returned to the shack to see that Jack had posted a message to the board that he would be calling CQ on CW on 50.115. Having lost track of conditions, I quickly checked the band and found it to be open towards Utah. With little expectation, I tuned the receiver to 50.115 and immediately heard Jack calling CQ on CW! After picking myself off of the floor, I answered Jack and he immediately responded as we exchanged 449 signal reports! Jack signal was weak but steady along with a slight flutter. Once again, the magic band had caught me by surprise when a routine opening into Utah had

suddenly become far more than I had ever expected!

Tuesday, July 8th, 2003 started out like any normal summer morning but would soon turn into the most exciting day I have seen in over 30 years of operating on six. The band was already open when I got out to the shack at 0730. For the next hour the band bounced around between the Great Lakes states and Ontario with the odd W2 popping up now and again. The skip was decidedly east-west, favoring the border states. There had been massive Es openings all day in almost every part of Europe, with Es strong enough to get to 2m for much of the day. With the Es building quickly in North America, it looked like things could get interesting.

At 0845 the band suddenly went quiet and nothing was heard for about 30 minutes when the 5x9 signal of VE1YX was heard. The appearance of VE1 via Es is very rare. As he faded out, K1TOL in Maine took over, his 5x9 signal being the only one heard on the band. About ten minutes later, Lefty faded out and VE9DX appeared! It had been an interesting morning but the best was yet to come. As Andy's signal faded away, the band apparently went dead... or had the skip just shifted further to the north? No beacons were heard but a quick check of the 48.250 western European video channel showed a strong signal. The video buzz was continuing to build in

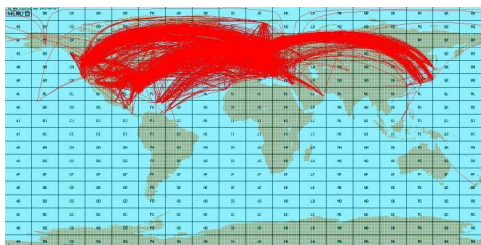


strength when suddenly IK2ECC (599) appeared on the band calling CQ! Two more Italian stations were worked before the band shifted to Germany and then to the Netherlands. This amazing propagation lasted for an unbelievable two and a half hours with 44 different European stations worked as the spotlight shifted around Europe from the UK, the Baltics and Italy. Evidently the widespread Es generators in Europe as well as in North America were accompanied with intense Es over the north Atlantic and the polar regions. A later check of the geomagnetic polar activity showed almost nothing happening in the auroral zone - the day was the quietest in several months. I suspect the almost total absence of geomagnetic activity played a large part in the stability and generation of the global Es that developed that day. It was surely a day to remember on the magic band and probably one not likely to ever be repeated!

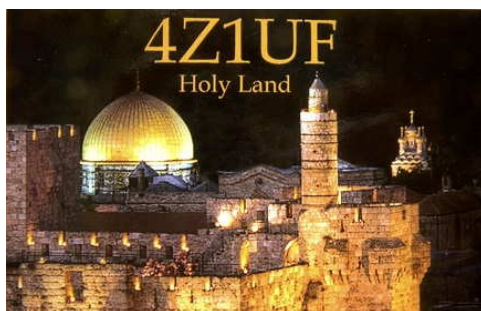
This last statement continued to ring-true for almost 10 more years... until the 'magic' struck again...

Friday, June 29, 2012, began like most other summer mornings, with a 6 a.m. glance at the ON4KST website to check 6m conditions before my morning bike ride. The ride would have to wait today... Europe was being reported in the PNW! A quick dash to the shack found Joe, CT1HZE, and a few others, CQing on CW. For the next five hours, the band remained open to 'somewhere' in Europe, with signals coming and going... wave after wave. As the sporadic-E clouds continually shifted alignment, individual signals rarely lasted for more than thirty to forty seconds and contacts were short and fast. All

QSO's were on CW except for a short exchange again with CT1HZE, when his loud signal suddenly appeared on 50.110 SSB! The previous day, I had jokingly remarked to Ralph (VE7XF) that my re-tallied 6m DXCC total was now at 77 worked and that I probably wouldn't live long enough to work 100... Ralph told me to eat more vitamins. I may need those vitamins yet, but the day ended with 7 new countries worked and a significantly shortened climb to the long-sought DXCC. With 31 QSO's in the log (DL, F, SP, CT, ON, GM, IT, LZ, SV, LY, EI, G, S5, I, EA8) it was truly another great day on the Magic Band and, as the 6m QSO map shows below, one never to be forgotten!



For all of the contacts that have been made and for all of the cards that have been collected, I think none of them have brought me more pleasure than the one shown below.



It, more than any other, represents what is so truly 'magical' about this part of the spectrum. It is contacts like this that have kept me mesmerized, for over forty years

now, by the sheer unpredictability of 'six'.

Normally, during the summer Es season, I rise early and check the Internet to see what has been happening on 'six' back east, before heading to the shack to have a listen. More often than not, the band is quiet and the morning regime continues, uninterrupted. On the morning of July 13, 2012, there was no indication that the band was open... in any direction. There were no beacons from anywhere in North America to be heard. There were no 49 mHz videos from the N-E, indicating the very rare polar path to Europe might be brewing. There was but one signal heard... 4Z1UF, in Lodd, Israel, calling CQ on .087 CW! Ilya quickly answered my call, with a 'GM Steve' (we had worked each other on 160m the previous winter), followed by a fast exchange of signal reports, and he was gone... in and out in less than 60 seconds. I give all of the credit for this amazing contact to Johnny, KE7V, a very skilled 6m operator about 40 miles to the southwest of me, and to Ilya. Earlier, during my routine internet check, I saw that Johnny had just posted a QSO with Ilya on 6m about two minutes earlier! I was stunned, as the only propagation indicated on the map was a small opening between the eastern U.S. seaboard and Europe. I rushed to the shack, turned the amplifier on, and began to tune the band... but nothing was heard. How could this be... a 6000+ mile contact between the west coast and Europe only three minutes earlier and no indication that the band is open... no signals from any direction? I knew that Johnny was too good of an operator to make an error but it looked like I was too late for the action.

One thing noted over the years, between here and KE7V's location, is that very often, we rarely hear what each other is working... especially on long-haul signals that often land in our backyards with extremely small footprints. However, it seems that those same signals that neither of us could hear earlier, will show up a few minutes later, as the footprint dances to the north or to the south. About seven minutes after Johnny's QSO, Ilya's signal suddenly popped-up... in mid-CQ... and right on schedule! Johnny also reported a very short appearance of Ilya's signal at his location. Thankfully he had been slowly tuning the band while watching the 'Tour de France' bike races on TV, when he stumbled across Ilya's weak CQ... almost hidden by a local 'birdy' at his end. This was true 'heads-up' operating on both station's part and thankfully Ilya continued to CQ into a 'dead band' for some time before his signals drifted to the north and into my own backyard! Ilya reported no indicators of west coast propagation from his end and his only QSO's were with Europe and one east coast USA station... another amazing summer morning on the magic band!

### Using TV Video Signals To Find 6m DX

Before digital TV, most dedicated 6m operators could spot possible openings to Japan or Europe by listening for the high-powered TV video signals coming from Siberia (for JA indicators) as well as for central and western Europe. These are the frequencies that I used for JA prop checking. I believe most of them were located around Vladivostok or Kamchatka in eastern Siberia. They were also valid for central European markers if you suspected there may be propagation directly over the pole to Europe.

These frequencies were all the "zero-beat" frequencies. With your radio in the 'CW' mode you should hear the carrier tone by tuning to these frequencies, assuming that there was suitable propagation.

49.740.0 (UAØ, UA9)

49.744.0 (UAØ)

49.749.5 (UAØ, UA9, UA1)

49.758.5 (UAØ)

49.765.2 (UAØ)

Unfortunately, if you lived near lots of homes, you may have heard a lot of other strange stuff in this region which may have lead you to think you were hearing the video when you were actually hearing a neighbor's latest appliance or spurs from their baby-monitor! One of the ways to determine if you were hearing the real thing was from the direction. From southern VE7 land, the signals would peak very sharply around 310 degrees, so if the signals you heard did not fall off immediately from this direction, they were something else. These signals, no matter how strong or weak, always have a high fade rate. Often they will swing from s0 to s7 or s8 within a few seconds. Only on strong F2 openings during sunspot-high winters do these signals sit at s9+++ with the s-meter pegged. Only on a few occasions have I heard these signals at s9 on Es and even then, they fade up and down often. Another clue is that there are often several transmitters sharing the same frequency so you may have heard two or three signals all on the same frequency, separated by a few tens of hertz, but enough to tell that you were listening to more than one transmitter and all fading at different rates. The actual signal itself was not pure DC but had a fast repetitive video 'sync pulse' which

made the note sound slightly 'growly' or 'buzzy'. You couldn't really notice this easily until they got stronger, but they didn't sound like a pure cw carrier. Once you have heard one you will know... and noted how fast they faded up and down. I have never worked JAs on Es without hearing the videos first so without them I believe there is little hope.

The same could be said for the Central and Eastern European videos as to sound and fade rate.

The amazing opening of June 29, 2012, allowed me to scan for active video markers from Europe once again and the following signals from Central Europe were easily heard (rx in 'CW' mode). Particularly busy was 49.750, with several loud carriers all fading rapidly.

49.739.6 (numerous)

49.740.9 (UA4, UA6)

49.747.4 (UA3)

49.750.0 (numerous)

49.757.8 (UA1, UAØ)

49.760.4 (numerous)

These ones would peak up from 010 - 025 deg (from VE7) and for some reason sound a little 'raspier' than the Siberian ones.

One more note on the search for JA's via Es. There are several 10m beacons in Japan which you will likely hear via Es before you hear anything on 6m. If you monitor those beacon frequencies and start hearing them, at least you will know that there is a possible 6m Es path forming and close attention can be paid to listening on six.

The best times for EU openings from VE7 appear to be from around 0900 - 1030 local time, while the optimum



times for JA are from 1400-1700 local and any time after 2100 - midnight.

Although JA's have been worked on Es at other times, these appear to be the most common. Although I have never monitored for EU videos throughout the hours of summertime darkness, it appears that this may be an overlooked opportunity. The midnight Es opening during the summer of 2006 between KL7 and several European stations indicates that it may be a possibility for southern VE7 during the hours of darkness. As shown on the mid-summer (July 1st) map [left], VE7 is in 'twilight' all night long and a short single-hop to the north will provide an all-daylight path to Europe. Compare this to the often-worked late night JA path which appears to have even more twilight to pass through in order to hit daylight. The EU path is a possibility well worth exploring during the bright summer nights!

### Using 11m To Find 6m Sporadic E

I have found that monitoring the propagation on the 11m band to be the single best indicator of possible Es openings heading for 6m. Unlike 10m or 6m, the 11m (CB) band is populated with several THOUSANDS of stations with many of them running big antennas and high power. Although Es can form quickly throughout the 11m - 6m portion of the spectrum, it usually creeps higher in frequency as the density of the Es layer grows in size. On a normal summer Es opening, the directions that you hear on 11m will eventually arrive at 6m.

I usually put my HF transceiver on Es-watch during the summer, letting it run 24/7 and squelched on 27.385MHz (LSB), a popular 11m DX calling frequency. It seems that even the slightest hint of an Es cloud will produce a plethora of activity on this frequency which can provide a real 'heads-up' for what is coming to 50MHz. Once the 11m alert has been sounded, a quick check of the 10m CW Beacon Band (28.175MHz - 28.300MHz) will provide a few more hints about which direction to point the beam for possible 6m Es. Of course not all Es openings on 10/11m will produce an opening on six, but I have never heard Es on 6m without

hearing it on 10m as well. A few CQ's on six will often produce a response on what initially appeared to be a dead band.

### Don't Be A 'DX-Window' Lid!

One of the quickest ways to get the 6m community saying nasty things about you behind your back is to mess-up in the DX Window. The DX Window (50.100 - 50.125 kHz) has long been established for one type of contact only, that being a legitimate DX QSO.

The DX Window can only be of value if everyone follows these basic 'rules':

- If you are in the U.S.A. or Canada, DO NOT WORK ANY OTHER U.S.A. or CANADIAN STATIONS INSIDE THE WINDOW. The window is NOT for North America - North America contacts.
- Do not answer the "CQ" of U.S.A. or VE stations if you are in North America. This creates unnecessary QRM and chances are, they will not respond to your answer anyway. Calling or answering other North Americans in the DX-Window only reinforces bad operating habits, encouraging newcomers to do the same. If you want to work U.S.A. or CANADA, do it outside the DX Window!
- Work or call only stations outside of North America inside the DX Window.
- The only legitimate exception to these rules, that will not get you in the naughty-corner, is working a KL7, VE8, XE or some other such fairly rare North Americans.

I hate to say it, but some of the worst offenders to the successful function of the DX Window are my fellow VE's, many of whom don't know or don't understand the simple concept of how it works. Now that you know, pass it on!

~ Steve McDonald VE7SL

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Next issue: Part 2 – 6m operation today.

Steve has several blogs.  
Look for his articles at:

<https://www.qsl.net/ve7sl>  
and  
<https://ve7sl.blogspot.com/>



## Ham Tidbits...

General Electric is saying goodbye to the light bulb. The conglomerate is shedding a struggling business founded by Thomas Edison more than a century ago.

After years of failing to find a buyer, GE announced Wednesday it will sell its 129-year-old lighting division to smart home company Savant Systems.

The complete story from CNN [https://www.cnn.com/2020/05/27/business/ge-light-bulbs-sale/index.html?utm\\_source=feedburner&utm\\_medium=feed&utm\\_campaign=Feed:+rss/cnn\\_us+\(RSS:+CNN+++U.S.\)](https://www.cnn.com/2020/05/27/business/ge-light-bulbs-sale/index.html?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed:+rss/cnn_us+(RSS:+CNN+++U.S.))

Here is a nice RF patch panel, mounted in an almost completed desk, and a rough set of photos as the hutch took shape... They are approximately in order, and represent the timeline of construction.. <https://www.nk7z.net/rf-patch-panel/>

Although one wonders why, an amateur radio operator has applied to make exterior alterations at a single family home in Vancouver.

Little Hippo Enterprises is asking for a development permit to install three radio antennas on the roof of the house. According to city hall, the project will increase the height of the house at 439 East 54th Avenue by about 18 feet.

In a letter to the city, Little Hippo Enterprises wrote that amateur radio, which is commonly called ham radio, is useful during emergencies.

<https://www.straight.com/news/alterations-proposed-at-east-vancouver-home-for-installation-of-amateur-radio-antennas>

## KB6NU's Column

Dan Romanchik, KB6NU

### Does a Resonant Antenna Work Better Than a Non-Resonant Antenna?



*Every once in a while, I answer amateur radio questions on Quora, and sometimes I get requests to answer them. Well, a request popped up in my inbox this morning, and I just clicked on the link. I got a real chuckle from the two replies (see below) ... Dan*

**Reply #1** from “Retired EE with aerospace and biomedical experience & 8 patents.”

Yes a resonant antenna properly matched to the transmitter or receiver will work better a non-resonant antenna. Any antenna discussion **MUST** include the frequency or frequency band in order to be more detailed.

**Reply #2** from “Physicist, Electronic Engineer, Musician (1968-present)”

No. It may be easier to match a feedline to it, but once a current distribution is achieved in it, it radiates just as well as a non-resonant dipole.

So, antenna gurus, which one do you think is right.

**A third fellow replied:**

In order to avoid confusion, I offer a definition of a resonant antenna. (First of all, I am assuming you are not referring to an uncommon antenna type that has no resonance, no standing wave.) Irrespective of the feedline characteristics (assuming there is a feedline—could be fed directly by equipment), at its feed point, an antenna

presents a certain impedance value as a function of frequency. The frequency for which this impedance is resistive (contains no reactive component) is the resonant frequency.

The objective when feeding an antenna is to transfer as much power as possible to it. As with any type of load, this is accomplished when the source and load impedance values are “matched”. Following from the previous paragraph, a resonant antenna needs to be fed with source having a resistive impedance equal to that presented by the antenna.

At all frequencies other than its resonant frequency the antenna presents a reactive impedance component (inductive or capacitive) that adds to the resistive component. If the source impedance is still resistive, it is no longer matched to that of the antenna, so the power delivered to it is reduced. In other words, any series reactance

*When he's not trying to figure out which way current flows, Dan blogs about amateur radio at [KB6NU.com](http://KB6NU.com), teaches ham radio classes, and operates CW on the HF bands. Look for him on 30m, 40m, and 80m. You can email him at [cwgeek@kb6nu.com](mailto:cwgeek@kb6nu.com).*

of the antenna adds to the resistive (called radiation resistance) component to reduce the amount of current flow; so the antenna does not work as well.

This does not mean, however, that a non-resonant antenna cannot work as well. If the source impedance is adjusted to add reactance that is equal and opposite to that presented by the non-resonant antenna, the power delivered to it will equal that of the antenna's resonant frequency. A properly impedance "matched" non-resonant antenna works (radiates) just as well as a properly matched resonant antenna.

The equipment used to maintain this impedance "match" over a relatively wide frequency range is called an Antenna Tuner. Inasmuch as mounting and adjusting an antenna tuner attached/connected directly to the

antenna feed point is normally frightfully awkward, it is normally at the radio equipment end of the feedline. In this configuration, the feedline and antenna are automatically tuned simultaneously. There are implications for the most desirable type of feedline to use, but that is another discussion.

(Note: As the frequency is changed, the resistive portion of antenna feed point impedance varies as well, but this change is relatively minor and is also compensated for by the antenna tuner.)

I like this answer.

~ Dan KB6NU

## 2<sup>nd</sup> Generation Foxhunt Receivers Now Available

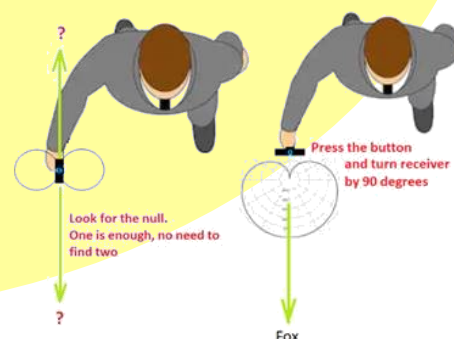
Just in time for the fall foxhunt season, second generation foxhunt receivers by Les Tocko VA7OM and Dave Miller VE7HR are now complete, with the production run tested, tuned up and available for sale.

My involvement has been in the administration and final assembly but otherwise all the credit for this technical achievement goes to Les and Dave. Having seen every unit up close, I can assure you that RX80M, as it is called, is of an exceptional professional quality. Full details on the cost, specifications, instructional video and ordering information can be found at [www.RX80M.com](http://www.RX80M.com).

Only 100 of these units are available. Although priority is being given to local orders, it will be "first come, first served" so if you want one, don't delay ordering.

80m transmitters (foxes) will be available soon.

~ John VA7XB

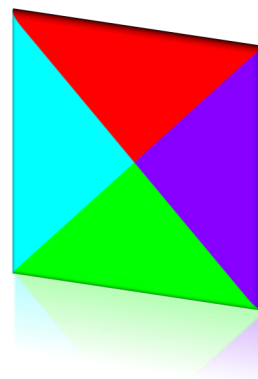




# Foundations Of Amateur Radio

Onno Benschop VK6FLAB

## *How to pick a field operating position?*



*To listen to the podcast,  
visit the website:*

<http://podcasts.vk6flab.com/>.

*You can also use your  
podcast tool of choice  
and search for my  
callsign, VK6FLAB.*

*Full instructions on how  
to listen are here:*

[https://podcasts.vk6flab.com/  
about/help](https://podcasts.vk6flab.com/about/help)

Much of the operation that I've done as a radio amateur is conducted in the field. That is, I tend to either drive my car to a location, or go out with friends and set-up camp to play. After you do this for a while you start to notice the things that you look for in an operating position.

The very first one is accessibility. That is, how easy is it to get there? It's fine coming up with the ultimate location, but if it's an hour's drive away and you've only got an hour to play, you'll spend all your time getting there and you'll be home late.

By contrast, for field days lasting several nights, I've regularly driven more than a hundred kilometres to find the spot, sometime much more than that. The point is that the accessibility changes depending on your available time. The journey to the location can be just as much fun as the destination itself.

How long you plan to be there will determine what antennas you might want to set-up. If you're there for an hour, you'll likely use a vertical on your car. If you're there for the weekend, your antenna farm will be determined by how much wire you brought and what you can hang it off.

Hanging antennas is the next thing. You can bring your own poles, but for height, nothing beats a solid tree. The taller the better. More taller, more better. If you have several to choose from, you get to play with all manner of fun stuff. For one antenna contraption we had three trees that we ran a

wire between. They were roughly spaced in a triangle about 200 meters apart from each other. As I recall, the antenna we built, a massive V-beam managed to talk to Europe for most of the weekend.

For another adventure a simple G5RV dipole was hoisted high into the trees. Another was accomplished by strapping a pole to a fence and setting up an inverted-V antenna. Recently we set-up an antenna that was nothing more than a wire running over the ground.

So, generally speaking height is good. You can cheat by having a low tree and a hill. Or a fence and a pole, or a gazebo and tent-pegs. What ever you can do to attach an antenna to will work to some degree. Which reminds me, if your hill is tall enough, it's likely to have a communications tower on it for someone, if not everyone. They're not the end of the world, but they can cause havoc with noise. Depends entirely on what the communication structure is used for. Bear in mind, some of these sites have noisy solar panel inverters or generators, so that too needs to be taken into consideration.

Another factor in picking a location involves water. Setting up a vertical on a jetty is gold. I've made many long-distance contacts using a vertical with a ground wire running into the ocean. Note that you don't have to actually get wet. Being near the ocean is often enough. I've had plenty of success from a beach car-park from a vertical on my car.

In general, man-made objects such as houses, factories, other cars, power lines, generators, boats, camping grounds with solar panels and plenty more are often bad news for HF communications. The biggest disappointment happens when you take the time to go to a site, set up camp, build your antennas, turn on the radio and all you hear is the noise from a nearby source of interference.

That said, you don't need to travel to the ends of the earth either. 15 minutes from my house is a lake with a park. There's a car park which on occasion attracts a motor home with a solar panel, but by enlarge it's a local park with people going for a walk. From a radio perspective, despite homes, businesses, schools and cars nearby, the place is heaven. It's quiet, it has shade, running water, fence posts and I regularly make contacts from there, right in the middle of the city.

That brings me to another aspect. Creature comforts.

Setting up near a busy road isn't fun. Neither is sitting in your car without shade. Having amenities within reasonable distance helps. For example, recently for a field day we set-up within 10 minutes drive from a regional centre. Didn't even notice it was there, happily dropped in for shopping and a meal. Some beers might have been consumed.

That same site also had high voltage power lines near our location. The only difference was that our site was above the power lines at the top of a hill, so we never even noticed them.

Finally, some of this is all about picking a camp-site that's suitable for radio, rather than a radio site that will handle camping. You get better at it the more you do it. If you check back after the adventure, you'll learn some stuff as well, so don't be shy to discuss your experience with your friends.

What ever you do, practice makes perfect.

~ I'm Onno VK6FLAB

## *Listening from the ground up*

When I started learning about antennas I was told height is might. The higher the better. For many years I've followed that advice and like a good little parrot I've dispensed that advice. Turns out that as is usual in our hobby, that's not the whole story.

I first came across a ground based antenna with a BOG, that's a Beverage On Ground antenna. It's essentially a long length of coax that's pointed at what you want to hear. You can either terminate the end, or not, different effects result with plenty of discussion about directivity, angles, lobes and the like.

One of the things you'll notice with you use a Beverage antenna is that it's quiet. All signals are reduced in strength, but that also means that noise is reduced. Turns out that this pays off and you hear stuff that you've not heard before. Excellent for a field day or if you want to hear some serious DX stations.

There's plenty of stuff that's not nice about a Beverage antenna. For one, it's highly directional, it takes up lots of space and if you

want to listen in another direction, you'll either build a second or third and switch between them. That, or you'll be rolling up and laying out the coax to point at a new DX entity.

You also cannot transmit with a Beverage antenna. While we're on the subject, often a beverage can be combined with a vertical, one for receive, the other for transmit. It's one of the projects that lying in my to-do pile. I've even got a remote controlled coax switch, but I'm still figuring out how to make my FT-857d do the switching.

I could stop there, but I came across another idea a couple of weeks ago. At the time I was being introduced to the local emergency communications team. They showed me their HF stand-by gear. Long piece of wire that you could chuck out on the ground and make contact. As a good little amateur I remember thinking to myself, these poor people they have a lot to learn. I'm glad I'm an eager apprentice in learning the art of keeping my big mouth shut.

During F-troop, a weekly net for new and returning amateurs, you'll find details on [vk6flab.com](http://vk6flab.com), another amateur was talking about putting a wire near the ground, like about a foot off the turf with great results.

I tried it on the weekend with a friend. We were out camping for a local amateur contest, miles from anywhere and anyone and I recalled the emergency communications people and the story during F-troop. We had some time to play, so we started with a long-wire, actually, pretty-much a wire dipole on the ground. Plugged it in, turned on the radio, magic. Same kind of sound effect as a Beverage antenna. Nice and quiet, good signals to be heard. We turned the whole contraption 90 degrees, no difference. Since then I've learned that it's pretty much omni directional and unlike a Beverage antenna, you can use it to transmit.

Of course it's not going to act in quite the same way as a dipole high in the air, and that's pretty obvious, since it's not in the air. It'll give you communications that are called NVIS, or Near Vertical Incident Skywave, essentially stuff that goes straight up and comes down, stations up to about 400 km or so away. For scale, that's enough to cover all of Holland. In Australia it's enough to cover the state of Victoria, or the width of the UK, and most of the width of the State of New York.

Before you get all huffy and point out that this is not a great DX antenna I'll beat you to it and tell you that this is not a great DX antenna. It's not meant to be. Nor is it intended to be an instruction on what antenna to build next. This is purely intended to illustrate that antennas come in all manner of shapes and sizes and there is lots to be learnt from trial and error.

I know that this is a "compromise" antenna. Guess what, so is every other antenna. Today the compromise is that we don't need any poles, trees or unsuspecting human support structures to keep an antenna in the air. You can essentially try this one for free at any time, on your own, on the beach, in a park or on the side of a mountain.

Another great use is to talk to your friends who live in the same city on HF. I have no doubt you could even manage some FT8 contacts using this antenna.

Next time someone tells you to put your antenna in the air, ask them who they want to talk to. If it's locals, then there is absolutely no need at all. As for mastering the art of keeping my big mouth shut, we'll see.

I'll leave you with this. It's not the answer that's important, it's the question, for everything else there's experimentation.

~ I'm Onno VK6FLAB

*All podcast transcripts are collated and edited in an annual volume which you can find by searching for my callsign on your local Amazon store, or visit my author page: <http://amazon.com/author/owh>. Volume 7 is out now.*

*Feel free to get in touch directly via email: [cq@vk6flab.com](mailto:cq@vk6flab.com), follow on twitter: [@vk6flab](https://twitter.com/vk6flab) or check the website for more: <http://vk6flab.com/>*

*If you'd like to join a weekly net for new and returning amateurs, check out the details at <http://ftroop.vk6flab.com/>, the net runs every week on Saturday, from 00:00 to 01:00 UTC on Echolink, IRLP, AllStar Link, IRN and 2m/70cm FM via various repeaters.*

*If you'd like to participate in discussion about the podcast or about amateur radio, you can visit the Facebook group: <https://www.facebook.com/groups/foundations.itmaze>*

*This podcast episode was produced by Onno (VK6FLAB). You can find more at <http://vk6flab.com/>*



## No-Ham Recipes

Rose-Marie Battig KB4RM

### Tosca Cake



This makes a lovely, rich cake, perfect for any special occasion. Says Rose-Marie, "This is a Swedish recipe, and the cake gets compliments wherever I bring it."

Rose-Marie suggests that you use an 11-inch flan pan with a removable bottom and with walls 1 inch high. A 9-inch pan could be used instead; the only difference is that the cake will be thicker. For those who have never used a flan pan, it is a pan with shallow, decorative sides, and is used to make single serving cakes like tarts, and quiches.

#### CAKE:

- 9 tablespoons (135 ml) butter
- 1/2 cup (125 ml) sugar
- 2 eggs
- 3/4 cup (200 ml) all-purpose wheat flour
- 1 teaspoon (5 ml) baking powder
- 2 tablespoons (30 ml) heavy cream

Preheat oven to 350F (180C or a very, moderate oven)

Melt the butter and let it cool. Whip eggs and sugar until fluffy. Sift flour with baking powder and Add cream and melted butter. Pour the mixture into a 9 to 11 inch greased and floured flan pan. Bake the cake for 30 minutes. At 30 minutes, remove cake from oven and spread the almond topping over the entire top in a thin layer. Put cake in oven for a further 15 minutes to brown the topping (maintain the 350F/180C temperature). Keep a close watch on the progress of the browning – let it get golden brown and no more.

#### ALMOND TOPPING:

- 3/4 cup (200 ml) almonds, sliced
- 2 tablespoons (30 ml) corn syrup
- 1/4" cup (125 ml) sugar
- 3 1/2 tablespoons (37.5 ml) butter

Melt butter in a small saucepan on top of stove. Add almonds, sugar and corn syrup, and heat on medium hot until the mixture bubbles. Remove from heat, and set it aside to cool, but be sure it stays somewhat warm so it can be easily spread over the cake top.



#### Social Reminder

The Surrey weekly social gathering is on Saturday at the Kalmar Restaurant at 80th and King George Boulevard between 7:30 and 9:30 am. You don't have to be a SARC member to participate. Bring your significant other, bring your family, see old friends and have fun.

## Back to Basics

John Schouten VE7TI

From The Canadian Basic Question Bank

### More On Safety



Following up on the last issue, here are some additional safety considerations, some of which will surely be on your basic exam.

**B-3-20-4** What equipment should be worn for working on an antenna tower?

- A. Approved equipment in accordance with applicable standards concerning fall protection
- B. A reflective vest of approved colour
- C. A flashing red, yellow or white light
- D. A grounding chain

Explanation: In Canada, worker safety is a provincial responsibility. A 'safety harness' and 'hard hat' are minimum requirements.

Fall protection safety products help prevent people working at heights from falling or decrease the risk of injury if they do fall. On-body products, such as safety harnesses and connecting devices, are worn on or attached to the body to arrest falls or lessen the effects of a fall. Fall protection products are frequently used in industries where the risk of falling is high, including telecommunications.

Minimum fall protection at height is an approved harness, safety belt and a safety tether, connected by approved and weight rated carabiner or snap hook.

**B-3-20-5** Why should you wear approved fall arrest equipment if you are working on an antenna tower?

- A. To keep the tower from becoming unbalanced while you are working
- B. To safely hold your tools so they don't fall and injure someone on the ground
- C. To prevent you from accidentally falling
- D. To safely bring any tools you might use up and down the tower



Explanation: 'Fall prevention' is a serious matter. In Canada, worker safety is a provincial responsibility. A 'safety harness' and 'hard hat' are minimum requirements.

**B-3-20-6** For safety, how high should you place a horizontal wire antenna?

- A. Above high-voltage electrical lines
- B. Just high enough so you can easily reach it for adjustments or repairs
- C. As close to the ground as possible
- D. High enough so that no one can touch any part of it from the ground



*Explanation: Even at modest power, touching a radiating antenna or open-wire line can lead to 'RF burns'. Voltage is not the only factor, radio frequency reaches deep into the skin, potentially causing nasty burns.*

*Suspending an antenna above electric lines is a dangerous mistake: if the antenna dropped, lethal voltages would be carried back to the station.*

**B-3-20-7 Why should you wear a hard hat if you are on the ground helping someone work on an antenna tower?**

- A. To keep RF energy away from your head during antenna testing
- B. So someone passing by will know that work is being done on the tower and will stay away
- C. To protect your head from something dropped from the tower
- D. So you won't be hurt if the tower should accidentally fall

*Explanation: Think for a second about a screwdriver, wrench or a heavy bolt falling on your head from a height of 14 metres (48 feet).*

In certain industries, such as construction, failing to wear a hard hat puts you at risk of serious injury, or even death. Hard hats contain an inner suspension, which provides approximately a 1 - 1 ¼ inch space between the shell and head. This space helps serve as a shock absorber in the event of an impact.

Because this is an integral aspect of the design of the suspension and its effectiveness, it is important that the suspension fits properly. Hard hats protect the skull, and have the capability for furnishing extra protection by attaching face shields, to protect the soft tissue of eyes and ears.

~ John VE7TI

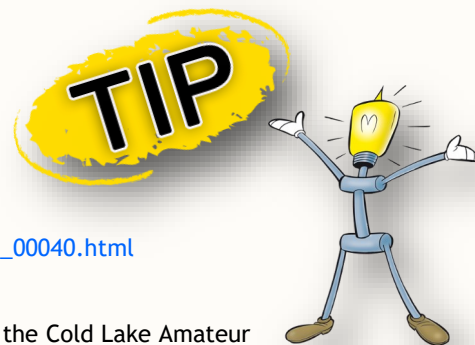
## Study Links

Whether you are new to the hobby or brushing up on skills, you should find these study links helpful:

1. RIC-7 is the entire up-to-date Industry Canada (IC) Basic Question Bank. <http://tinyurl.com/CanadaBasicQB>
2. Industry Canada (ISED) on-line practice page: [https://apc-cap.ic.gc.ca/pls/apc\\_anon/apeg\\_practice.practice\\_form](https://apc-cap.ic.gc.ca/pls/apc_anon/apeg_practice.practice_form)
3. The Amateur Radio Exam Generator is at: [https://www.ic.gc.ca/eic/site/025.nsf/eng/h\\_00040.html](https://www.ic.gc.ca/eic/site/025.nsf/eng/h_00040.html)
4. The ExHaminer Study software for Windows is at: <https://wp.rac.ca/examiner-v2-5/>
5. There are plenty of good resources for both basic and advanced exam study courtesy of the Cold Lake Amateur Radio Society at: <http://www.clares.ca/va6hal%20training.html>

Contact SARC if you wish to write the Basic or Advanced Exam. If you pass we'll even give you a year's free SARC membership!

**Newly Licensed?** When you receive your paper license in the mail, it will come with a form that can be filled out and mailed to the Radio Amateurs of Canada office, at which point an introductory RAC one-year membership will be set up. Introductory memberships are identical to our existing basic memberships and you will receive The Canadian Amateur magazine for one year.







### ***What is the BC Incoming QSL Bureau?***

The British Columbia Incoming QSL Bureau handles QSL cards being delivered to Amateurs in this province. That would generally be Amateur Stations with a Canadian call-sign starting with VA7 or VE7.

This bureau does NOT process cards that are outgoing. Amateurs wishing to send cards should consult the Radio Amateurs of Canada QSL Bureau website.

### ***How do I use this service?***

QSL cards sent to the Bureau manager will be sorted for delivery. When a card is received, the recipient's call-sign will be posted on the BC QSL Cards Awaiting Pickup page. If your call is there, you should contact the Bureau Manager using the information provided at the bottom of this page to arrange a delivery method. This may include direct pick-up, delivery, or mailing.

### ***Backlog***

At this time there are many cards, dating back years, that have not been picked up. We will attempt to deliver these and to notify the recipient via this site. Future plans are to list cards in a database you can access on our website. Your assistance is requested to make this site address known to other stations so that we can contact as many Amateurs as possible to make them aware of this service. If you see a call-sign listed with cards waiting, and happen to have contact that person, please make them aware so that we can expedite delivery.

A link to this URL on your club or organization website would also assist in getting the word out.

### ***Do you have an interesting QSL card to share?***

We would like to feature QSL cards received by local Amateurs that are unique, rare or particularly attractive. If you have such a card and would like to share it with others visiting this site, please forward an image to the webmaster, [ve7ti at rac.ca](mailto:ve7ti@rac.ca) via email. Selected cards will be featured in a gallery on the QSL Card Gallery page.

### ***Ideas or Suggestions?***

We welcome your ideas and suggestions to make this site as useful as possible. Please contact us at the addresses listed below.

### ***Contact Information:***

BC QSL Bureau Manager  
Ken Clarke, VE7BC  
E-mail: [ve7bc at shaw.ca](mailto:ve7bc@shaw.ca)  
Telephone: 604.596.8786

### ***Bureau Mailing Address***

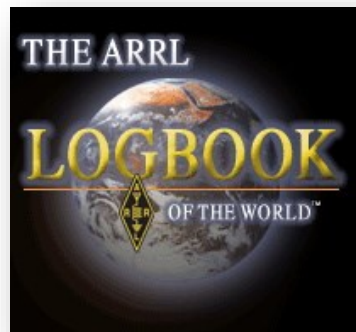
VE7-VA7 Incoming QSL Bureau  
Ken Clarke VE7BC  
12441 - 58A Avenue,  
Surrey BC V3X 1X6

<https://bcqsl.blogspot.com/>

<http://www.qsl.comm.sfu.ca/>

## Verification For Awards

### The Process For Claiming ARRL Awards



### QSL Card Verification For Awards

For those who are seeking ARRL awards, such as DXCC, there is a requirement to have QSL cards verified. The verification can be done by ARRL HQ or a local card-checker. I have recently been appointed as a DXCC Card Checker and I am now set-up to handle card verification.

Several years ago ARRL introduced an on-line application <https://p1k.arrl.org/onlineDXCC/> to simplify the process. Using the Online DXCC Application, the user can select the cards that he or she would like to have checked by a card checker and, at his or her convenience, type that data into a form (which can be saved and retrieved at any time until submitted) and make an application for DXCC. When the application is finished, the participant will be able to print the list of cards and take or mail the list and the cards (in the same order that they are entered into the form) to a card checker who will check the cards, note any changes and send the form to ARRL HQ.

(NOTE: Amateur radio operators outside of the US do not need to be an ARRL member to participate in the DXCC programme.)

In addition, the card checker can review the necessary documentation for joining the Logbook of the World (LoTW) programme. This involves an in-person review of your operating certificate and another government piece of identification.

If you would like your cards checked for the DXCC program please contact me by email prior to sending your cards and application.

You can contact me at:  
[rick.williams at ve7tk.com](mailto:rick.williams@ve7tk.com)

<http://www.ve7tk.com>

Many thanks.

~ 73, Rick VE7TK

### From the NSARC Newsletter;

Here is a story that took 30 Years to come together! As I received my QSO cards from the bureau a few days ago, there was a surprise, as one of the QSO cards in it was from 30 years ago!

I have contacted UA3QKA and he sent following return (thanks to online translators I can get what he wrote back)

Translated from Russian: "Hi, I am very glad that you received a card after 30 years. Apparently this is how our Bureau works. Don't get sick 73"

PS: to be fair to the QSO card people, it was partly my fault for not signing up for the service. Thank you to all the volunteers that make this special delivery service possible! It just sat in a shelf for 30 years and was in pristine condition!

~Alex - VE7DXW



# July 2020

| Sun                                                                                                                                                                                                                     | Mon | Tue                                               | Wed                                                                                                                                                        | Thu                                                                                          | Fri | Sat                                                                                                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----|------------------------------------------------------------------------------------------------------------------------------|
| <p>For details on all SARC events, go to <a href="http://ve7sar.net">ve7sar.net</a></p> <p>For details on all SEPARS events, go to <a href="http://separ.shutterfly.com/calendar">separ.shutterfly.com/calendar</a></p> |     |                                                   | <p>1</p> <p><b>Canada Day Contest</b></p>  <p>Jun 30 5pm – July 1 5pm</p> | <p>2</p> <p>Contest: <b>13 Colonies Special Event</b></p> <p>1300z July 1 – 0400z July 7</p> | 3   | <p>4</p> <p>7:30-9:30 AM SARC Social: Kalmar Family Restaurant<br/>8076 King George Blvd, Surrey, BC</p>                     |
| 5                                                                                                                                                                                                                       | 6   | <p>7</p> <p>1930 SEPAR Net<br/>2000 SARC Net</p>  | 8                                                                                                                                                          | 9                                                                                            | 10  | <p>11</p> <p>7:30-9:30 AM SARC Social: Kalmar Family Restaurant</p> <p>CONTEST: IARU HF World Championship from 1700 Hrs</p> |
| <p>12</p> <p>CONTEST: NA QSO Party (RTTY)</p> <p>CONTEST: IARU HF World Championship to 1700 Hrs</p>                                                                                                                    | 13  | <p>14</p> <p>1930 SEPAR Net<br/>2000 SARC Net</p> | 15                                                                                                                                                         | 16                                                                                           | 17  | <p>18</p> <p>7:30-9:30 AM SARC Social: Kalmar Family Restaurant</p>                                                          |
| <p>19</p> <p>CONTEST: NA QSO Party (RTTY)</p>                                                                                                                                                                           | 20  | <p>21</p> <p>1930 SEPAR Net<br/>2000 SARC Net</p> | <p>22</p> <p><b>1900 SARC Exec Meeting</b></p>                                                                                                             | 23                                                                                           | 24  | <p>25</p> <p>7:30-9:30 AM SARC Social: Kalmar Family Restaurant</p>                                                          |
| 26                                                                                                                                                                                                                      | 27  | <p>28</p> <p>1930 SEPAR Net<br/>2000 SARC Net</p> | 29                                                                                                                                                         | 30                                                                                           | 31  |                                                                                                                              |

Contest Details: <http://hornucopia.com/contestcal/contestcal.html>



# August 2020

| Sun                                                                                                                            | Mon                | Tue                                   | Wed                                | Thu                            | Fri | Sat                                                                                                                                 |
|--------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------------|------------------------------------|--------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                |                    |                                       |                                    |                                |     | 1<br>7:30-9:30 AM SARC Social:<br>Kalmar Family Restaurant<br>8076 King George Blvd,<br>Surrey, BC<br>CONTEST: NA QSO party<br>(CW) |
| 2<br>CONTEST: NA QSO<br>party (CW)                                                                                             | 3<br><b>BC Day</b> | 4<br>1930 SEPAR Net<br>2000 SARC Net  | 5                                  | 6                              | 7   | 8<br>7:30-9:30 AM SARC Social:<br>Kalmar Family Restaurant<br>CONTEST: WAE DX Contest<br>(CW)                                       |
| 9<br>CONTEST: WAE DX<br>Contest (CW)                                                                                           | 10                 | 11<br>1930 SEPAR Net<br>2000 SARC Net | 12                                 | 13                             | 14  | 15<br>7:30-9:30 AM SARC Social:<br>Kalmar Family Restaurant<br>CONTEST: NA QSO Party<br>SSB                                         |
| 16<br>CONTEST: NA QSO<br>Party SSB                                                                                             | 17                 | 18<br>1930 SEPAR Net<br>2000 SARC Net | 19<br>1900 SARC<br>Exec<br>Meeting | 20<br>1900<br>SEPAR<br>Meeting | 21  | 22<br>7:30-9:30 AM SARC Social:<br>Kalmar Family Restaurant<br>CONTEST: Ohio, Hawaii<br>QSO party                                   |
| 23/30<br>23 CONTEST: Ohio,<br>Hawaii QSO party<br>30 CONTEST: W/VE<br>Islands & Kansas<br>QSO parties<br>WW Digi DX<br>Contest | 24/31              | 25<br>1930 SEPAR Net<br>2000 SARC Net | 26                                 | 27                             | 28  | 29<br>7:30-9:30 AM SARC Social:<br>Kalmar Family Restaurant<br>CONTEST: W/VE Islands &<br>Kansas QSO parties<br>WW Digi DX Contest  |

Contest Details: <http://hornucopia.com/contestcal/contestcal.html>

## The Contest Contender

### *Socially Distanced Team Contesting with N1MM+ Via VPN*

John Schouten VE7TI



“  
*Networking computers  
attached to separate  
transceivers has long  
been a feature of  
N1MM...*

Fred Orsetti VE7IO typically hosts contests at his well-equipped station. Fred is enthusiastic about opening his station to both new and established testers to enjoy the benefits of a first-class setup. For the past several years a group of us have been invited to participate. In March of this year our team contesting ground to a halt because of COVID-19. Fortunately, Radio Amateurs of Canada (RAC) opened up a possibility for the Canada Day Contest by permitting a group of testers to operate from home locations as a team.

Our contesting software of choice is the free package provided by [N1MM+](#). N1MM provides not only logging but a host of associated applets that round out the package with voice and CW audio macros,

multiple transceivers, rotator control and digital modes. In short, too many features to list here but a visit to their website will provide the reader with a full description.

The programmers behind N1MM (all Hams from

what I can determine) realized that COVID presented some unique challenges to contesting, specifically team contesting. They came up with a solution that would make it possible to create a contest team, entering a contest with a common log from geographically diverse stations. Networking computers attached to separate transceivers has long been a feature of N1MM and we have used it successfully for years, but those computers were on a common local network.

The N1MM crew suggested that team contesting is also possible by use of a Virtual Private Network (VPN). A VPN gives you online privacy by creating a private network from a public internet connection. VPNs mask your internet protocol (IP) address, so your online actions are virtually untraceable. Most important, VPN services establish secure and encrypted connections to provide greater privacy than even a secured Wi-Fi hotspot. Surfing the web or transacting on an unsecured Wi-Fi network means you could be exposing your private information. VPNs essentially create a data tunnel between your local network and an exit node in another location, which could be a few or thousands of miles away. VPNs use encryption to scramble data when it is sent over a network. Encryption makes the data unreadable and it prevents anyone else on



the network from eavesdropping on your internet activity.

Enter the suggested VPN provider: [LogMeIn Hamachi](#). They are a hosted VPN service that, according to their website: “lets you securely extend LAN-like networks to distributed teams, mobile workers and your gamer friends alike. Hamachi uses the server to locate the computers, and all exchanges are done through a peer-to-peer (P2P) protocol. You can easily print a document stored on you home PC from the office, but also create your own virtual local network to play games with friends.” LogMeIn Hamachi offers a free plan for up to five stations, and more at a fee.

Installation is a simple two-step process:

1. The master station sends the invitation. The remote stations reply and log-in to show up on the VPN network.
2. The master station then confirms remotes for access to the N1MM network.

Once this is done stations are listed in the N1MM network window. It is important to note that, to log onto the N1MM network, remote station setup must be exactly as the master station setup. That includes installing the same program version, CTY file and correct contest name. We decided on a Thursday afternoon to do the log in test because N1MM usually updates the software on Tuesday and it would allow an opportunity to resolve any issues.

To their credit, RAC recognized that distributed multi-op would be an opportunity to have stations participate in the Canada Day contest as a team, given that operating from a common location was not advisable due to COVID . Although we would not be eligible for awards, Fred VE7IO suggested that this might be a way for our team to participate as VE7RAC, our usual RAC contest callsign. Fred and I set up a trial connection with little effort following the suggested steps. It worked flawlessly! We next launched N1MM+ and opened the networking window. Both of our stations were listed. It couldn't be this simple?

Encouraged, Fred invited two more stations, AL VE7WJ and Jim VE7FO. After a minor connection glitch, we found that you do not actually create your own Hamachi account,

but merely follow the steps in the invitation sent by the Master Station. This made a total of four stations connected by VPN. We setup a dummy contest and all of us successfully entered a variety of callsigns and watched them populate the master log.

Fred VE7IO went looking for a contest that we could all participate in as a test for the RAC event and found <http://portugaldaycontest.rep.pt/rules.php> It is a CW and SSB event and our score would be for a check log only as there is no category for distributed multi-op. The Portugal Day contest was scheduled on the following weekend, only a few days ahead, so we agreed to use this as an opportunity for a ‘live’ test of the system.

This contest is listed in N1MM but in a trial would not allow us to log distributed multi-op successfully. Two days before the contest Jim VE7FO sent off an email to one of the program authors. The following day he received a reply saying that they would try to program a patch. The next day we received a follow-up email that the modification had been made. A quick check confirmed that it was working. An amazing response by the N1MM crew, especially since this is not commercial software. Bravo N1MM!

The following day was Saturday, the start of the 24-hour contest. Propagation on phone was dismal but CW saved the day with 69 contacts. The important part was that it all worked as expected. Unfortunately, this is not a recognized category for Field Day 2020.

June 30th, and as I prepare this edition of The Communicator for publication, I'm contesting as a member of the VE7RAC team in distributed multi-op mode. I'm connected to VE7IO as is VE7FO and VE7WJ. The spots are appearing on our common bandmap and the master log is starting to accumulate some contacts.

Jim VE7FO







John VE7TI

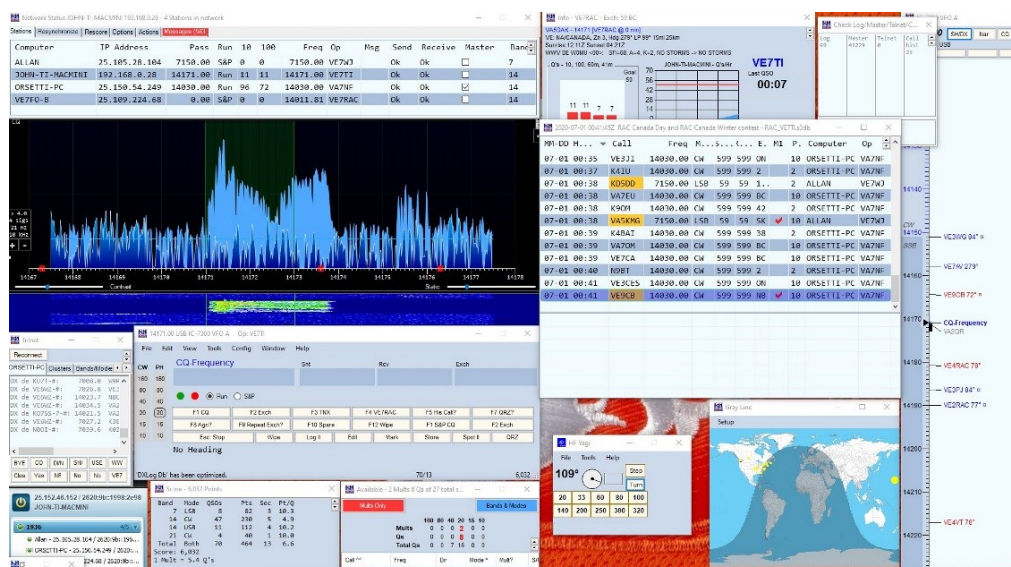


The LogMeIn Hamachi VPN window for distributed operation.



Stan VA7NF, guest operator at VE7IO

| Score - 371,530 Points |      |      |      |     |      |
|------------------------|------|------|------|-----|------|
| Band                   | Mode | QSOs | Pts  | Sec | Pt/Q |
| 1.8                    | CW   | 12   | 74   | 2   | 6.2  |
| 3.5                    | CW   | 63   | 380  | 5   | 6.0  |
| 3.5                    | LSB  | 67   | 592  | 3   | 8.8  |
| 7                      | CW   | 211  | 1062 | 8   | 5.0  |
| 7                      | LSB  | 142  | 1032 | 7   | 7.3  |
| 14                     | CW   | 478  | 2266 | 12  | 4.7  |
| 14                     | USB  | 153  | 1238 | 8   | 8.1  |
| 21                     | CW   | 51   | 282  | 6   | 5.5  |
| 21                     | USB  | 10   | 84   | 2   | 8.4  |
| Total Both             |      | 1187 | 7010 | 53  | 5.9  |
| Score: 371,530         |      |      |      |     |      |
| 1 Mult = 22.4 Q's      |      |      |      |     |      |



N1MM+ running in multi-op contest mode. Note the top network left window designating VE7IO as master station

Although not as busy as Field Day, and the solar conditions are abysmal, there are stations to be worked. Fortunately, we log quite a few US stations as well. This breaks pauses between Canadians and, although many likely will not submit a log, we do encounter some major US contest stations looking for the official provincial RAC stations as they are worth 20 points. Canadian stations are 10 points and all others 2 points.

The end of the contest, at 1700 Pacific time, and it has been a steady flow of contacts with a few, but not many, runs. VE7IO and VE7FO worked CW while VE7WJ and VE7TI worked sideband. The LogMeIn Hamachi and N1MM combination was flawless, and at no point did it fail or cause concern. I'll repeat the two important points to note if you contemplate this setup.

1. Make sure that all stations on your network run the same version of N1MM. My version had updated just before the contest

and I was out of sync with the other stations, unable to connect. Once we were all on the same version connection was immediate.

2. Designate a Master Station. This station should create the LogMeIn Hamachi account, set up N1MM, and share the spots. The Master Station sends the Hamachi invitations to the VPN client stations.

Not critical, but advisable, ensure all stations have the same *wl\_cty.dat* country file in N1MM. You can update it under the 'Tools' menu in N1MM.

Given the COVID situation, distributed multi-op was a necessity for team contesting. Credit to RAC for permitting this, although it is unfortunate that doing so makes us ineligible for awards. It works well enough that it will hopefully become a recognized category for this and other contests going forward.

~ John VE7TI

Our RAC Canada Day contest final tally





*Kudos to John Brodie VA7XB, Les VA7OM and Jan VA7VJ for their efforts in this year's BC QSO Party. They out VE7SAR on the map again!*

*Thanks also to Rebecca VA7BEC who puts in lots of effort each year to make this 'local' contest a success.*





# Field Day 2020

## — A Time to Adapt



Another Field Day weekend has come and gone and it was not in the usual format this year due to the health situation. The ARRL made some amendments to the Field Day rules that permitted individual stations to operate as class 1D, this is single operator, home station. If you took part, you can still contribute toward our club score by listing our club on your score submission as 'Surrey Amateur Radio Communications'. Please do not vary from this by putting Surrey Amateur Radio Club or SARC as the entries have to be consistent to count. ARRL will aggregate the entries by club name when the results are published. Remember, any contact counts, whether HF, VHF or UHF. Phone (voice) contacts are 1 point, CW or digital 2 points and satellite 100 points. If you need more information or assistance contact me at [communicator@ve7sar.net](mailto:communicator@ve7sar.net).

Surrey Mayor and Council once again declared the week leading up to Field Day as "Amateur Radio Week". See our Blog Post at <https://ve7sar.blogspot.com/2020/06/surrey-celebrates-amateur-radio-week.html>. Thank you to John Brodie VA7XB for doing the necessary paperwork, thank you to Mayor and Council for this recognition and to the Surrey Fire Services for your continued support.

If you are having Field Day withdrawal, enjoy videos of our past efforts at [https://www.youtube.com/channel/UCWuQJJqt0pwHTO\\_wGPB0-uA](https://www.youtube.com/channel/UCWuQJJqt0pwHTO_wGPB0-uA)

The Canada Day contest followed immediately after Field Day. Five local operators at four stations took part as VE7RAC in a new distributed multi-operator format. That is, we operated from our own station, but we were connected via Virtual Private Network (VPN) to keep a master log in N1MM+. This also let us share spots and monitor the other participating stations' progress. SARC member Fred Orsetti VE7IO coordinated this effort and it worked very successfully. Thank you to RAC for allowing this format.

See page 84 for the story on distributed multi-op contesting.

~ John VE7TI







# Proclamation

## Amateur Radio Week

June 21 - 28, 2020

**WHEREAS** Amateur Radio operators are celebrating over a century of the miracle of the human voice broadcast over the airwaves and has provided a bridge between peoples, societies and countries by creating friendships and the sharing of ideas; and

**WHEREAS** the City of Surrey has several hundred licensed Amateur Radio operators who have demonstrated their value in public assistance by providing radio communications during emergencies and public service events; and

**WHEREAS** Amateur Radio operators are on alert for any emergency local, regional or worldwide and donate their services without compensation; and

**WHEREAS** Amateur Radio Field Day exercises that will take place on June 27 and 28 demonstrate Radio Amateurs' skills and readiness to provide self-supporting communications without the need for additional infrastructure;

**NOW, THEREFORE, BE IT RESOLVED** that I, Doug McCallum, do hereby declare the week of June 21 - 28, 2020 as "Amateur Radio Week" in the City of Surrey, in recognition of this important emergency preparedness exercise.

Mayor Doug McCallum  
City of Surrey

# Radio-Active

John Brodie VA7XB

## Profiles Of SARC Members



Vlad Koval VA7LKO

Volodymyr (Vlad) Koval was born in the Lugansk Region of the Ukraine to Fedor Koval and Polina, both former soldiers in WW II. He has one sister, Olga. Vlad married Larysa in 1973 and they have 2 sons, Volodymyr and Denys, born in the Ukraine.

Vlad graduated from Ukrainian University in 1970 with a B.Sc. in Chemical Engineering. That same year he began his career with SVEMA Company which was similar to Kodak in the US, first as an engineer, and eventually moving up the ladder to Senior Manager responsible for Profit and Loss and the performance of 1200 employees.

In 1993 Vlad discovered he had relatives in Chilliwack BC. Following their advice, he applied to the Canadian Embassy in Kiev for a Landed Immigrant Visa which he received in 1996, arriving in Toronto in 1997. He worked at various supervisory jobs including Cangel Inc, Genpharm Inc, Power Packaging, Pepsi Cola (all in Ontario), City Bread in Winnipeg, Maple Leaf Consumer Foods in SK and ConAgra Foods in AB. He retired from ConAgra Foods in 2013. After that his career took a another turn when he commenced working as a school bus driver in Alberta and Surrey.

Vlad has fond memories of the Ukraine which he describes “a great country and fine people”, but notes that everything changed after the collapse of the Soviet Union in 1991. Since that time the country has suffered under poor leadership. He says that “the Ukrainian people want to build a democratic society but, regrettably, it is a long journey from dictatorship to democracy”.

Now fully retired, Vlad enjoys chess, volleyball, table tennis and hunting in addition to his latest interest, ham radio. When he hunted in Taber Alberta, there was little need for any communication devices because of the wide-open spaces and easy access. After moving to Surrey in January 2017 he joined a hunting club. His first BC hunting experience in the mountains near Cache Creek convinced him he needed a radio, so he inquired about getting his license.

Vlad graduated from SARC's Fall 2019 ham class, achieving his basic with honours certification. He soon realized there are lots of opportunities for ham radio operators



to get involved within their community, so he joined SEPAR to make his contribution to public service. Vlad confesses he is very lucky to have an excellent Elmer, Keith, VE7KWK, who has assisted with his technical challenges. Speaking to the future, Vlad plans to erect an HF antenna, explore digital radio and, after the COVID has passed, resume his pursuit of CW proficiency.



*Vlad after the hunt; at work and on his 60th birthday*



## *Annual General Meeting*

It is a challenging time we are all living in and we hope everyone is staying safe and healthy.

The SARC board of directors have decided to postpone the AGM in June in order to adhere to provincial COVID-19 guidelines for physical distancing. While the pandemic situation is slowly improving and BC is starting to lift restrictions, we are unable to schedule an in-person AGM at this time.

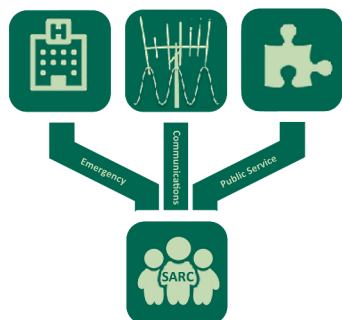
This is partially due to the lack of appropriate venues available to support us, and the need to maintain social distancing. We have considered an online AGM but it also has some logistical issues we must work through especially around member voting.

We will continue to follow the guidelines of BC's public health officers during this evolving situation and will update you again towards end of Aug with the possibility of an AGM to be held Sept 9. If at that time it does not appear that restrictions will lift enough to enable us to schedule our in-person event, a virtual AGM will be further considered. Whatever the final decision is we will provide notice of an AGM being scheduled and your options for attending and/or voting.

For now we would like to wish our members a good summer and we will hopefully be able to gather again in the fall.

~ SARC Directors





## Public Service

Don Hamilton VA7GL

### Amateur Radio Serving The City Of Surrey

#### ***Annual National Hurricane Center Station WX4NHC Readiness Test Successful***



*At the June meeting I announced my intention to retire from my position as director and chair of the public service committee effective June 30. As this was usually the last meeting before the summer break and Pam and I have travel plans starting in September, I felt this was the best timing for all.*

*This Summer I plan to participate with Parks on the Air, plus, I have just received my Yeasu Wires-x registration, and a openspot3 so I can start to expand my knowledge in digital modes.*

The National Hurricane Center's Amateur Radio station - WX4NHC - operators, working from homes, conducted their annual test to check readiness of the station and other amateur radio stations and operators around the country and world on May 30. The station marked its 40th year of public service there. Julio Ripoll, WD4R, the Assistant Amateur Radio Coordinator at the NHC, reports that five WX4NHC operators made 146 contacts with US and Caribbean stations despite poor propagation on the HF bands (7 and 14 MHz). They worked stations as far north as Maine, and as far south and west as Aruba and Curacao, Puerto Rico, and Texas, among other states and countries.

Operators also made many contacts using digital modes including Winlink. Ripoll also reported that operators worked many stations throughout Florida using the statewide SARNET UHF repeater network that connects 27 repeaters from Key West to Tallahassee.

Local/Nationwide Red Cross Drill: Initial Reports Indicate Success

The widely promoted Local/Regional/National ARES-Red Cross Exercise was conducted on May 30, with initial reports now coming in that are indicating widespread participation and interest. Locally-organized ARES exercises in 28 states across the country simulated emergency conditions and commercial power interruptions while working with their local Red Cross chapters to handle simulated shelter message traffic. The messages were entered into the Winlink (or Fldigi) system in the ARC-213 message format. CDC COVID-19 protocols were observed. Designated regional or state message hubs across the country received the messages from the local nets and passed them to a simulated Red Cross national authority, via the Winlink email system.

Members of the ARRL Sacramento Valley and San Joaquin Valley Sections participated with the California Gold Country Region Red Cross and 32 operators from throughout northern California were involved. The operators sent 35 voice messages using the California Amateur Radio Linking Association (CARLA) network, and 66 digital messages using both HF and VHF gateways, to a simulated Red Cross Operations Center. With current pandemic events in mind, the operators were emailed the messages to be sent to the operations center.

A Resource Net was employed to help manage Duval ARES personnel and equipment. The Winlink system handled four formal messages addressed to the Red Cross Disaster Operations HQ using the Red Cross message format. This helped train potential shelter radio operators in

using Red Cross general message and disaster requisition forms.

Duval operators also originated test messages for the Health and Medical sections at a simulated Emergency Operations Center. Objectives focused on training operators to properly follow.

Participants completed all 17 training scenario objectives, including potable water shutoff, personnel accountability, establishing simulated communications in support of Jacksonville Fire Rescue Department (JFRD) command and control operations, communication support to Jacksonville's Florida Department of Health office along with shelter

management issues. -- Duval Amateur Radio Emergency Service press release, June 4, 2020; Brian Schultheis, K4BJS, Assistant DEC, Crown District, and Assistant EC, Duval County, Florida

Stan Broadway, N8BHL, Ohio Section Emergency Coordinator, reported "We did well for the Red Cross exercise on May 30; we had more Winlink activity than expected. So we need to increase the penetration and use of Winlink along with/as a part of the Ohio Digital Emergency Network (OHDEN), which principally supports the Ohio state EOC, and our traffic nets."

## Quote of the Month

"I have been frankly fascinated with that unpaid group of people with those ham radios, the Amateur Radio Emergency Service (ARES) makes available a wireless system that seldom if ever can be totally disrupted by a disaster -- ham radio operators are the heart, the soul and the life blood of that system." -- The Hon. Mayor Willie Brown, Mayor of San Francisco (1996-2004)

~ Don VA7GL

Article reprinted courtesy of the ARES e-news letter

## The New South SARC Repeater

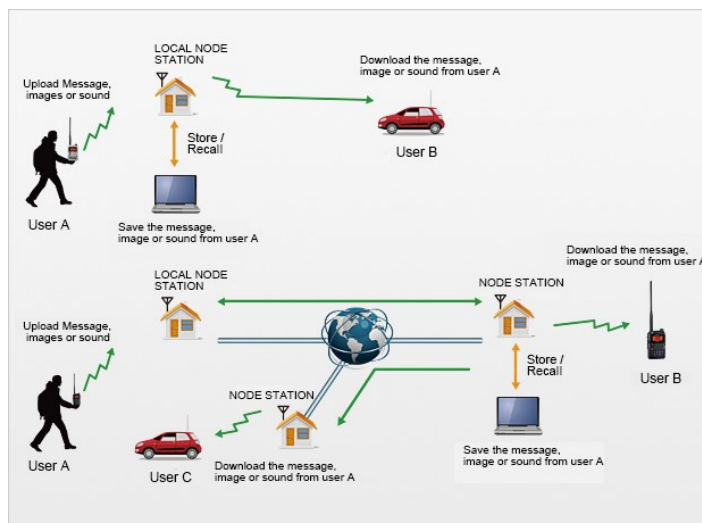
It was a little known fact, that SARC actually has TWO repeater sites in Surrey, the primary site at Concord Tower, with both VHF and UHF repeaters, IRLP and Echolink (the North Repeater) and a second VHF repeater in the area of 128<sup>th</sup> and 62<sup>nd</sup> Ave in Surrey (the South Repeater).

The repeater in the South site, although still working, is approx. 50 year old. Through the BC Gaming Grant program and the Yaesu Repeater Program, SARC was able to purchase a NEW Yaesu Fusion DR-2X Repeater, at significant discount, which supports both standard analogue and Yaesu Fusion System (Digital).

The repeater has been implemented on the same frequency as the Primary VHF repeater at 147.360, however, the tone is set for 103.5 (where the primary repeater uses a tone of 110.9). If you program your radio for the tone of 103.5, you will key the new south repeater, give it a try.

If you have a Yaesu Fusion radio, the repeater can be used with C4FM Digital mode, also give this a try. We will also implement Yaesu Wires-X with this repeater, WIRES (Wide-coverage Internet Repeater Enhancement System) is an Internet communication system which expands the range of amateur radio communication. More to come on Wires-X over the summer as we roll out this feature. The addition of the new repeater at the South site will also provide better coverage for our members to the south, if you are on the south side of Surrey and have issues hitting the North repeater during the Tuesday night Net, try using the South repeater on the next Net.

**NOTE:** We do request that Net Control Operators use only the North Repeater for the time being. The South Repeater has no access to IRLP and Echolink and our users cannot hear the net if they listen on those modes.





## SEPAR Report

Gord Kirk VA7GK



With the on-going COVID pandemic occurring, it has been some time since we have been able to meet in person. Just like many businesses and families we have been working to keep in touch. As amateur radio operators we continue to meet on the weekly 2m radio net. The last few weeks we began testing ZOOM for meetings and have found that it has provided a method of communications and meeting that will allow us to visit, train and continue to work together as a volunteer group.

At our most recent virtual meeting we had DJ Lawrence provide an excellent presentation on personal emergency preparedness. During our last in person meetings, where we discussed the basics in communications, we also thought it important to think about our individual readiness. In the last issue of the Communicator we explored in-depth a Personal Communication Plan. In this issue I would like to review at a high level the presentation we had on personal preparedness. DJ provided a great presentation that covered the following topics:

### **Grab and Go kits**

- Have one for each family member
- Use an easy to carry Backpack / bag by the front door
- Essentials only

- Good shoes to walk in?
- Rain jacket
- Prescription Medication
- Copies of Important Documents (ID, Spare keys)
- Make sure you can carry it over long distance if necessary
- Portable Amateur Radio (or FRS if not licensed).

### **Home Emergency Kits**

- Food & Water
- AM/FM Radio
- Flashlight
- Clothing (prepare for worst - bad weather / walking)
- Blankets
- Medication (Prescription and those available over the counter ie. Tylenol, Ibuprofen, Imodium)
- Small container purposely for insulin with cold packs / ice for when power goes out
- Spare Glasses (Extra pair stored in a hard sided container)
- First Aid Kit
- Spare Batteries
- Money / Change
- ID



Note: Do not store batteries in Radio / Flashlight, but do keep the batteries with the the Radio/Flashlight in a baggie or taped to it.

### First Aid Kits

- Get training and keep up to date
- Red Cross / St John Ambulance/ others offer training
- Have a first aid kit in ALL emergency kits

### Food and Water

- Store foods that
- Require little or no prep
- Are familiar (comfort)
- Will not increase thirst (not too much salt)
- Store a couple of large bottles of frozen water in the freezer.
- Keeps freezer frozen longer when electricity is out
- Also provides bottles of water.

### Home Prep

- Ensure you have a working:
- Smoke alarm
- Fire Extinguisher
- CO2 alarm
- Ensure you know where Gas / Water / Electric shutoffs are
- All family members familiar with at least 2 home evacuation routes
- Get an escape ladder for balcony or upper window. (rope with loop for lowering pets down)

### Pets

Have a grab n go bag for pets too!

- Food and Water
- Leash
- Blanket/Crate
- Toys
- Litter / Newspaper
- Plastic Bags
- Bowls
- Registration and Vaccination Certificates

Note: Shelters may not take pets in if you do not have a current Registration and Vaccination Certificate

Check your supplies every time the clock changes to and from Daylight Savings time!

I think many of us have had one of those moments during this recent COVID-19 crisis when we have come to realize that perhaps we have not been as prepared as we thought we were.

We all learned about shortages with Toilet Paper, Hand Sanitizer, Masks, Flour and Yeast!

For SEPAR we are discussing these non-radio related topics that each one of us must come to understand in order to help our community. During a time of need we must be prepared ourselves, so we are able to serve when asked.

If we are asked to attend to any location to set up and operate our radios to provide communications, we should expect to provide for ourselves

during our work. We do not want to be a burden on the resources in an area we are going to provide help. As well, knowing our family is safe and supplied will allow us to focus on the task at hand and not be worrying about our families at home.

If we are in the unfortunate position of being someone who has to evacuate, we will be more comfortable and confident, able to think clearly as the very basics will have already been looked after in our preparations.

At the beginning of this article I noted we were just beginning on a series of back to basics with our radio equipment, when all of our meetings were stopped. As the situation improves and we are able to meet and focus on training, we will be starting to work with each SEPAR member to progress from basic use of our radios to simple digital communications using our computers and radios.

I hope everyone is keeping safe and doing well during our time of physical distancing.

As always if you have any questions about SEPAR please contact me.

~ Gord Kirk VA7GK  
SEPAR Coordinator



## 2020 IOTA Expeditioner of the Year Award

**Mike Zavarukhin VE7ACN**



*Mike adding to our Field Day score*

The **IOTA** (Islands On The Air) Program is an exciting and innovative activity that has caught the interest of thousands of radio amateurs worldwide. Established in 1964, it promotes radio contacts with stations located on islands around the world to enrich the experience of all active on the amateur bands and, to do this, it draws on the widespread mystique surrounding islands. It is administered by Islands On The Air (IOTA) Ltd. in partnership with the Radio Society of Great Britain (RSGB).

SARC's very own Mike Zavarukhin VE7ACN has been a very active participant in the program and he has received several awards for his participation over the past several years, but this year he came in first so...

A hearty congratulations to Mike on receiving the 2020 IOTA Expeditioner of the Year Award! The award was announced live on Ham Nation on May 27, 2020.

Video at <https://youtu.be/At6h8SJUbfo?t=3483>

Mike's website: <https://www.ve7acn.com/kopiya-glavnaya-russkij>

Read Mike's SARC profile from a past 'Communicator',

and a description of his **Russian station** from a past club presentation.

~ SARC



*Below L>R: The award, Mikes QSL Card, and Mike (in the grey T-shirt) at SARC-SEPAR Field Day*



# SARC Notes

## Basic Course Update

After our COVID classroom shutdown, the course was adjusted to be continued on-line. It was completed without further interruption with glowing feedback at the conclusion. One student wrote: "Great course, this turned out better than expected. I could stay home during the presentations, in my easy chair, in my PJs with my iPad and a cup of tea."

At the conclusion of the course, students successfully wrote the exam in small groups at covered picnic tables in a local park, maintaining appropriate physical distancing.

We are currently receiving requests to offer the course this summer based on self-study, using our on-line material. This includes the manual, slides and classroom presentations. Contact [sarc@ve7sar.net](mailto:sarc@ve7sar.net) for availability. We do plan to offer a fall course, tentatively scheduled to start Tuesday, September 22, 2020. It will be in the classroom unless the COVID situation requires us to present it on-line again. Either way, we're confident we have the capability.

*Several exam sessions were provided to small groups. Here our newest Examiner Kevin McQuiggin VE7ZD administers the exam to a group of our Spring 2020 class students*



*Post-isolation  
Saturday morning  
coffee*



*The therapy  
dog after I  
share all my  
problems*



## 13 Colonies Special Event

Once again the annual (the 12th) '13 Colonies Special Event' will take place between 1300z, July 1st and 0400z July 7th.

The certificate is printed on heavy card stock. Stations working one state or, as many as all 15, will be eligible for the certificate.

A "Clean Sweep" indicator will be affixed for those lucky enough to work all 15.

A special endorsement will be attached for stations contacting their sister operation, WM3PEN, in Philadelphia, PA, where independence was declared. New since 2015, the 13 Colonies have added a second sister event station.

GB13COL will operate from Durham, England. The 13 Colonies certificate will have a Liberty Bell added for a contact with WM3PEN.

See: <http://www.13colonies.us/>

~ OPDX



*Apparently we are not frightened enough yet to eat tofu!*

# Ham Gear For Sale

**RigExpert "AA-55 Zoom" antenna analyzer.** Less than a year old. Purchased new at HRO in Portland, OR in January 2019. The unit has the original box, manual, all accessories and is in perfect shape. On sale price at HRO is US\$328.95. That is \$328.95 x 1.32 or C\$434.21. **For sale at C\$375.00**

## 70 cm Fast Scan TV Transmitter

For sale is an analog fast scan (NTSC standard) ATV transmitter in a hardened and waterproof metal case. Suitable for mounting outdoors. Last used by hams at Simon Fraser University on an emergency communications project in the early 1990s. Runs on 12 VDC. Approximately 100 feet of power/antenna/control cables included. As is, but if it doesn't work to your satisfaction you can return it. **\$100 OBO.**

Contact: Kevin McQuiggin VE7ZD/KN7Q [mcquiggi@sfu.ca](mailto:mcquiggi@sfu.ca)



Kjeld has a rather large Marine Radio (HF?) sitting at his home and he'd like to find a new home for it. If you're interested contact Kjeld.

Contact: Kjeld [VE7GP@telus.net](mailto:VE7GP@telus.net)



We're  
**QRT**  
for this issue

## What Level of Preparedness Are You At?

By Onno VK6FLAB

An often repeated statement about the purpose of our hobby is related to emergency preparedness. The various peak bodies around the world devote plenty of resources to the concept, with helpful examples, umbrella organisations, training, coordinators, grants and funding, photo-opportunities and all the other trimmings that come from the idea that you and I are going to be of assistance in the case of some or other emergency.

Looking up the various emergency coordination groups is a disappointing experience. From broken web-sites with non-existent pages to latest news that's over two years old, through to the latest sausage sizzle and fun-run. Entreaties to make sure that you have your current Membership ID card, otherwise you won't be covered for insurance purposes. As I said, all the trimmings with lots of evidence of paper pushing and little or no evidence of actual preparedness, let alone public information that might help any new or old radio amateur become prepared.

Back to the topic at hand and leaving aside the nature of the emergency for a moment, given that the response for a bush-fire, a cyclone, flood or pestilence is likely to be different.

Let's look at the things we have direct control over.

If you have at any time taken your radio out of the shack and carried it into a paddock, connected it to an antenna, fired it up and made a contact, you're well ahead of the curve.

There are plenty of amateurs who have never ever considered what going field-portable might look like, let alone tried it. That's fine if you live in a bunker, have independent power and are able to withstand all manner of disaster scenarios, but realistically it likely means that your emergency assistance will be of the kind that's outside the emergency zone. Helpful to be sure, but there's plenty of those stations to be found - unless the issue is global, in which case we have a completely different set of problems, pandemic, anyone, anyone?

Let's focus on the other side of the fence.

You're in an emergency zone. Doesn't matter what kind of emergency. Communications are limited or overwhelmed, information is restricted, messaging is hampered and you're a radio amateur with a working radio. If all goes well you should be able to help.

So what does a working radio look like and what does helping mean?

First thing to think of is power. Have you got a battery? Is it charged? When was the last time you tested it? How long has it been sitting on the shelf? Did it discharge in the meantime? What about a charger? Have you got a generator? What about fuel and oil? What about spare parts? Have you got something else, like a solar panel, a wind generator or a water turbine? What about a push-bike with a dynamo attached? How long does your radio run on a battery and at which transmitter power level is that?

## SARC SOCIETY DIRECTORS 2019-2020

### PRESIDENT

Stan Williams VA7NF  
[president at ve7sar.net](mailto:stan@ve7sar.net)

### VICE PRESIDENT

Anton James VE7SSD  
[vicepresident at ve7sar.net](mailto:anton@ve7sar.net)

### SECRETARY / WEBMASTER

Jeremy Morse VE7TMY  
[secretary at ve7sar.net](mailto:jmorse@ve7sar.net)

### TREASURER

Scott Hawrelak VE7HA  
[treasurer at ve7sar.net](mailto:scott@ve7sar.net)

### DIRECTORS

Steve McLean VE7SXM

Kevin McQuiggin VE7ZD

John Schouten VE7TI  
(SARC Publications/Blog)  
[communicator at ve7sar.net](mailto:john@ve7sar.net)

One Position Vacant

### SARC MEMBERSHIP, NET & CONTEST MANAGER

John Brodie VA7XB  
[membership at ve7sar.net](mailto:john@ve7sar.net)

### SARC QSL MANAGER

Heinz Buhrig VA7AQ  
15684 102 Avenue  
Surrey, BC V4N 2G4

### SARC REPEATER MANAGER

David Sinclair VA7DRS  
[repeater at ve7sar.net](mailto:dave@ve7sar.net)

After thoroughly investigating power, what does your actual emergency station look like? Will it be used for voice communication, or will it be used as a digital gateway? Can you use it to send rudimentary messages, or can it be used as an internet gateway for a local community?

What bands are you planning to operate on? Do you have an antenna? What happens if your current antenna is taken out by a fire, lighting strike or something else? When was it last tested? Do you have a back-up antenna? Have you actually used this antenna? Does it have all the right connectors and are they with the antenna?

So, pretend that you got all that right. What about you? Have you got spare clothes? Food? Shelter? Medication? What about Personal Protective Equipment, masks, gloves, what-ever? What about ancillary items like pen and paper? Do you have power for the laptop that's being used to create the digital mode messages?

Note that I've not said a word about the usefulness of any of this. This is the base level of preparedness just so you can actually look yourself in the mirror and say that you have at least got a level of ability to be of assistance in the case of an emergency.

You can of course argue that you should hook up with the local emergency services and offer your skills as a radio amateur. That's helpful, but what if you cannot actually go to the muster point? How does that help?

Now lets pretend that you actually have done all this. When was the last time you tested it?

What does the actual helping look like?

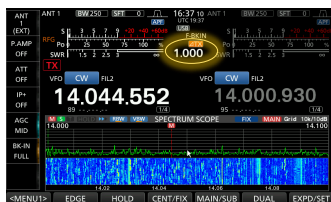
Have you ever attempted to pass emergency messages? What about messages that must be transferred absolutely 100% correctly, think medication dosages? Who did you pass them to? When was the last time you did a regional emergency simulation between your amateur friends? How often do you do this? Once a decade, or more often than that? What if the local repeater isn't working? What about in your club or your local neighbourhood? Do your neighbours even know you exist?

The point of all of this is to reveal that the level of emergency preparedness for radio amateurs is in my opinion spotty at best. If you disagree with me because you are prepared I'd like to ask if you helped prepare your local amateur community and the wider community around it? I don't doubt that there are individuals, even groups who are prepared, but I suspect that they are far and few between.

When was the last time you actually went into the field for a week and played radio, for real, battery only, limited resources, no outside help?

I'd love to believe that this is universal, but you and I both know that there is plenty more to be done. How realistic is your emergency preparedness and what are you going to do about it?

~ I'm Onno VK6FLAB



*Answer from page 46: I had the RIT/XIT on, and I was transmitting 1KC above my receive frequency. I am not sure how this happened but it just did and it messed me up for sometime. The rig is the Icom 7610.*

~ Mike VE9KK





June is the month when we wrap up another Amateur Radio year. It's been great but there is some unfinished business.

We hope to see you through the summer at our Saturday morning social meetings in lieu of the regular general meeting. Have a great summer and we will start another great SARC season in September.

Please note that we are tentatively looking at September 9 for our Annual General Meeting if the COVID situation permits.

**SARC** hosts an Amateur Radio net each Tuesday evening at 8 PM. Please tune in to the VE7RSC repeater at 147.360 MHz (+600 KHz) Tone=110.9, also accessible on IRLP node 1736 and Echolink node 496228.

On UHF we operate a repeater on 443.775MHz (+5Mhz) Tone=110.9 or IRLP Node 1737.

*We are looking for a SARC Net Manager. Its not a difficult job and, if you have some time to spare, we'd like to hear from you. Basically it involves scheduling someone to do the Tuesday evening weekly net.*

|                                                          | SARC Net<br>20:00 Hrs          |
|----------------------------------------------------------|--------------------------------|
| 1 <sup>st</sup> Tuesday<br>Standby                       | Jean-Luc VA7JLU<br>Vacant      |
| 2 <sup>nd</sup> Tuesday<br>Standby                       | Jinty VA7JMR<br>Sheldon VA7XNL |
| 3 <sup>rd</sup> Tuesday<br>Standby                       | Rob VE7CZV<br>Vacant           |
| 4 <sup>th</sup> Tuesday<br>Standby                       | Kapila VE7KGK<br>John VA7XB    |
| 5 <sup>th</sup> Tuesday<br>Standby                       | Vacant<br>John VE7TI           |
| Want a turn at Net Control? Contact the SARC Net Manager |                                |

## Down The Log...

### SARC Monthly Meetings

2<sup>nd</sup> Wed. (Sept-Jun)  
1900 hrs at the [Surrey Fire Service Training Centre](#),  
14923 - 64 Avenue,  
Surrey, BC. Here is a  
what3words link and map:  
[https://what3words.com/  
markers.addiction.ozone](https://what3words.com/markers.addiction.ozone)

### Weekly SARC Social

Saturday between 0730  
and 0930 hrs at the  
Kalmar Family Restaurant  
8076 King George Blvd.  
Surrey

### SARC Net

Tuesday at 2000 hrs local  
on 147.360 MHz (+)  
Tone=110.9

### SEPARS Net

Tuesday at 1930 hrs local  
on 147.360 MHz (+)  
Tone=110.9

### VE7RSC Repeaters

2m: 147.360 MHz +  
Tone = 110.9 Hz  
IRLP node 1736  
Echolink node 496228

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Tone=110.9

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IRLP node 1737



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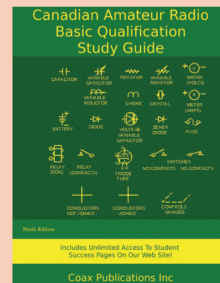
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